McGRAW-HILL DIGEST

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Bright Atom Age Coming?

In year 2 of Atom Age it becomes clear that the Man vs. Atom struggle can produce great benefits for all—if war is abolished

U-235 can serve man as a new compact source of heat energy for power generation, comfort heating, or industrial processing. But radio-active isotope byproducts of pile operation are more immediately important—in biology and medicine.

Peacetime applications of atomic energy will use dilute U-235 or plutonium as a "fuel", mixed with carbon or some other moderator to slow the neutrons, increase the "hits," and keep the chain reaction going. The diluting agent may be either U-238 or thorium, or both. These will do double duty, because neutron bullets convert U-238 into the energy-yielding plutonium and thorium into U-233 which may prove equally serviceable.

Thus the commercial piles of the future will "burn" U-235 to make other atomic fuels which, in turn, will deliver heat energy to the pile. In that way it will be possible to get from the pile far more heat than the equivalent of 1,400 tons of coal for each pound of U-235 split. This highly attractive prospect will speed the day when nuclear energy can compete with coal.

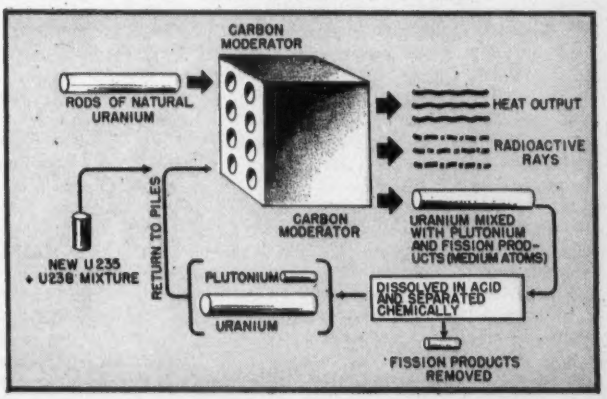
While already mechanically obsolete, the piles making plutonium for bombs at Hanford, Wash., reveal the basic principle on which future piles for power and heat will operate. The heat, now wasted, will be put to work. The plutonium, now removed for bomb manufacture, will be returned to the pile (or left in) as supplementary fuel.

It will be years, or decades, before everyday application of nuclear energy will prove economical. To compete with conventional plants, the piles must first be redesigned to operate at temperatures high enough for good power-plant efficiency. Also, the techniques of operating piles by remote control through the heavy radiation screens must be radically improved.

The Hanford piles operated on natura uranium containing only 0.7% of U-235 The typical commercial plant of the future will use more than 0.7% of U-235 or plutonium, but less than 50%. This will avoid both the low efficiency of the too-lean mixture and the excessive fuel cost of the rich mixture. It will permit piles of moderate size and take maximum advantage of U-238 and thorium as potential sources of plutonium and also of U-233.

One should not expect U-235 to re-

The slow-neutron pile can make plutonium for bombs—or heat for power, processing, and comfort.



place coal generally in this generation, although a few central power stations and ships will try it out before Year 10 of the Atomic Age.

Atomic power, in forms now known, is impracticable for automobiles and small airplanes, because of the large initial investment in uranium and the need to carry 50 tons of shielding to protect riders and pedestrians against the deadly radioactivity.

Some day, ultra-high temperatures from splitting atoms will be used for special industrial operations on metals and other materials. Even the dreaded atomic bomb might easily serve peaceful ends—blasting lakes in deserts, changing the course of rivers, leveling mountains.

The special industrial equipment and methods developed for the bomb project will find hundreds of important uses—mostly for purposes unrelated to atomic energy. These developments include pumps with neither seals or leaks, leak detectors of amazing sensitivity, ultratight welding, a portable mass spectograph for quick and automatic gas analysis, new ways of handling corrosive and poisonous materials, new diffusion barriers for the separation of gases and of petroleum products.

Yet more important than any of these, in the long run, will be the hundreds of radioactive isotopes now available as byproducts of pile operation. Chemically indistinguishable from the ordinary forms of the elements, these isotopes serve as tagged atoms if mixed with common stable atoms of the same species. With them, the course of any element or compound may be traced through the bodies of men, animals, and plants. A suspected hyperthyroid condition can be diagnosed by feeding the patient a minute amount of radioactive iodine. The click of a Geiger counter on the patient's neck will tell (1) what percentage of the swallowed iodine concentrates in the thyroid cells and (2) how rapidly that concentration was accomplished, giving a definite indication of the state of the gland.

In similar fashion, the radioactive isotopes of hydrogen, oxygen, and carbon will trace out the intricate transformations of carbohydrates and proteins in the human body. Radioactive phosphorous will explore the bones, radioactive iron will show how and where blood cells are formed. Radioactive sodium will time the circulation of blood.

In chemistry, radioactive isotopes will speed the understanding of metallurgical and organic reactions. In industry they will measure flow, detect leaks, and do other useful work.

Meanwhile the uranium piles will be manufacturing certain radioactive isotopes that can serve as cheap but effective substitutes for high-cost medical radium.

As for atomic weapons, the world faces a real and enormous task. We must end war. No other control of atomic weapons exists. The nations are embarked on an atomic armaments race, and in 5 to 10 years any major industrial nation can make enough atom bombs to destroy all the major cities of any other country overnight. If war comes, atomic weapons will be used.

An able and ingenious plan for controlling atomic energy has been presented to the United Nations Atomic Commission by the American delegate, Mr. Baruch. It will internationalize nuclear science and release for mankind the beneficial applications of atomic energy. But it will "control" atomic bombs only to the extent of giving the world brief warning of a nation's preparation to use them—which is why we must end war.

Under the Baruch plan, an International Atomic Development Authority would be built up, and to it the United States would turn over, at various stages of its organization, all atomic bombs, knowhow, raw materials, facilities, and stockpiles of the fissionable materials on hand. —ALL McGRAW-HILL PUBLICATIONS

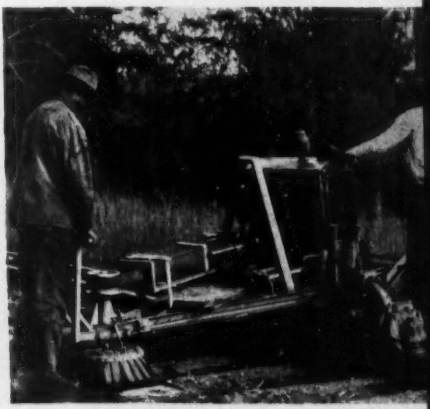
Rapid Railroad Repair

Past practice of using small gangs to patch up track and roadbed is giving way to production methods

By developing new methods and machines for reconditioning and maintaining railroad track, a construction company, operating in Georgia, on peak days replaced more than 1,000 ties, surfaced more than 3,000 ft. of track and unloaded 50 cars of ballast. In 1 week as much as 2½ mi. of trackwork was completely reconditioned—100-lb. rail replaced by 130-lb. using new tie-plates, spikes, bolts, rail anchors and many new ties; new ballast laid, small vertical curves eliminated, and track completed.

Rail relaying—All material was distributed well ahead of operations by work train. A wrenching machine uncoupled bolted joints at rate of 1 per min. Following the spike puller, a series of revolving brushes swept ties clean (using only 3 men where 18 had previously been required), and two adzing machines prepared the ties for new tie plates at a rate of one rail length every 1½ min. A rail

Top left: Wrenching machine uncouples bolted joints. Bottom left: Revolving brushes sweep ties clean. Top right: Adzing machines prepare ties for new plates. Bottom right: Cribbing machine removes ballast.



crane placed new rails in position, angle bars were installed and gaging and spiking were done by hand.

Tie Replacement—Three miles behind relaying, ballast was removed by cribbing machines, an auger type on open track and a wheel type on road crossings. Jacks relieved the pressure on the old ties, the track was raised 3 in., and compressed-air tools nipped and spiked the new ties.

Ballasting and Dressing—New granite ballast was unloaded from hopper-bottom cars in sufficient quantities to permit a 4-in. raise of track. Three 4-unit electric tampers were used. After 1 week of use, final surfacing raised the track to proper grade. A self-propelled machine with V-shape center plow and side wings then dressed the ballast between the tracks and distributed it uniformly on the slopes. —CONSTRUCTION METHODS

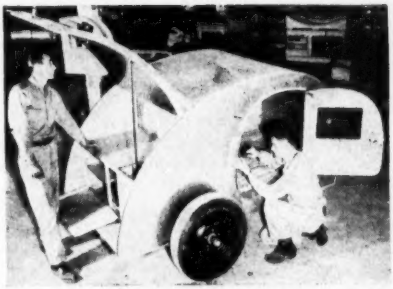
NO-SHRINK, NO-STRETCH RAYON FABRICS

Permanent stabilization of viscose rayons by treatment with a water solution containing glyoxal and acid catalyst has been achieved by Cluett, Peabody & Co. The fabric is wetted with the solution by means of a padder tank, or auxiliary immersion tank, excess solution being removed by squeezing the fabric between the padder rolls. Then moisture is eliminated by drying the fabric on a tenter frame, and the dry fabric is heated to react the glyoxal with the cellulose. Unreacted chemical and catalyst are removed from the fabric by washing in soap and soda-ash. Finally the fabric is slack-dried to take up the small amount of potential shrinkage remaining, and then strained on a tenter frame to the proper width.

Stabilization has no stiffening or harshening effect on hand or texture; the fabric will withstand washing at any temperature; no offensive odors develop because no hydrolysis occurs in storage; reacted glyoxal is a permanent part of the fiber; stabilized fabrics have no chlorine-retention properties, so white and pastel-shade fabrics can be treated.

Other finishes requiring the same handling—such as certain durable water-repellent treatments—can be combined with glyoxal stabilization.

Residual shrinkage in the stabilized rayon is less than 2%.—TEXTILE WORLD



MIDGET SLEEPER—Accommodating 2 sleepers, this little, lightweight automobile trailer has a galley and 25-lb. insulated icebox. Assembly-line produced by Kit Mfg. Co., it has a welded steel tubing frame and a torque-bar wheel suspension. —AMERICAN MACHINIST

MADE OF MAGNESIUM

Capitalizing on the lightness of magnesium and on the ease with which it may be deep drawn and machined, fabricators are exercising ingenuity in devising new uses for it, among them:

Airducts	Bicycles
Artificial limbs	Knitting machine parts
Baseball masks	Lawnmower parts
Dock boards	Piano parts
Floor trucks	Portable broadcasting equipment
Flyrod cases	Portable power tools
Gravity roller conveyors	Propeller hub caps
Griddles	Pruning shears
Hand trucks	Radar equipment
Household furniture, airplane seats	Railroad flash signal lights
Rowboats, canoes	Skis
Rungs for firemen's ladders	Slide rules
Scooters and toys	Typewriter parts
	Wheelbarrows

As to corrosion, proponents claim magnesium is at least as good as mild steel. —BUSINESS WEEK

BIG FUTURE FOR INDUSTRIAL FLYING

One of the brightest spots in the U. S. aircraft manufacturing picture is the mushroom growth in purchases of private executive and transport aircraft by business and industrial corporations. Hundreds of companies are taking to the air—or plan to when the planes are available—to save time and costs, attain a time advantage over competitors. Many other corporations are preparing to contract with a rising new group of business men in aviation, those who maintain high-speed, smartly equipped transports and a staff of expert pilots, ready on a few hours' notice to fly anywhere on assignment. —AVIATION NEWS

FOUNDATION CASINGS JACKED INTO GROUND

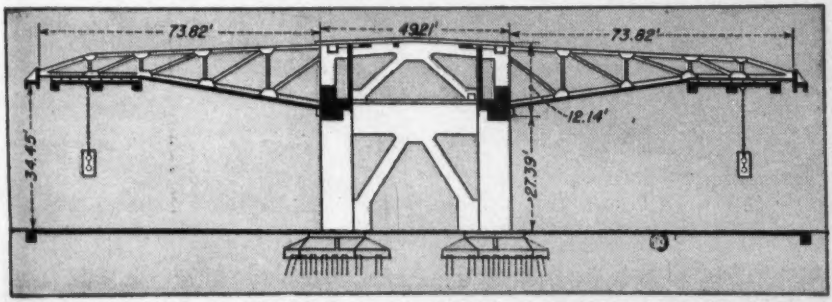
To lay foundations for heavy machinery after the building foundation had been completed, 4-ft. long sections of 5-ft. dia. reinforced-concrete pipe were forced into the ground by jacking against the second-floor steel. A jacking frame and 3 jacks were used and, if necessary, alternate jacking created a slight rocking motion to overcome heavy resistance. Excavation inside the pipe kept pace with the jacking. When 3 of the tongue-and-groove sections had been set to give a 12-ft. deep foundation, a reinforcing mat was placed at the bottom, vertical dowels set, and concrete placed. For 4 foundations, labor was 362 man-hr., cost was $433. —ENGRG. NEWS-RECORD

STUD WELDER SPEEDS PRODUCTION

Savings of 50% or more in time and labor are effected in attaching studs to gear boxes by an automatic stud welding machine at Paramount Mfg. Co., and studs are fastened to the end plates of a vegetable washer at a rate of 200 an hour with this equipment. Previously it was necessary to drill and countersink the plate, insert flat-head machine bolts, and hand weld for water-tightness. Attachment of sack hooks to a bagging machine is speeded importantly by welding pointed studs to the bar stock and shaping by bending. —WELDING ENGINEER

EYES FOR DRONE PLANE

First tactical use of television-controlled aircraft was in the Bikini atom bomb test. A Boeing B-17 carried 2 television sets to give the crew of a safely distant control plane a view on one screen of the space into which the drone was flying, and on the other the image of the drone instrument panel.—AVIATION NEWS



MORE HANGAR SPACE—By cantilevering concrete roof trusses on either side of central rigid frames, a hangar in Rio de Janeiro provides a high coefficient of usable space to enclosed area. Five such frames produce a 4-section hangar 415x197 ft. Supported on the lower chord of the trusses, reinforced concrete arches, spanning 17.26 ft. with a rise of 1.64 ft., form a 1⅜-in. thick roof. At and near the truss ends, concrete beams support 4½-ton cranes. Danger of tension members cracking was 80% reduced by concreting after centering was struck. —ENGRG. NEWS-RECORD

Ways to Low-Cost Operation

Part II—Eighteen practical ideas which management can put to work quickly to reduce factory expenses and improve product quality

Factory Lighting—Production in a polishing department jumped 35% after light intensity was increased from 16 to 35 foot-candles. . . . Accident rate dropped 54% in a punch press department when a substandard 1.5 foot-candles was increased to 19 f-c. . . . Adequate illumination at inspection points minimized inspector eye fatigue, cut errors 25%. . . . Photoelectric control of lighting not only maintains adequate illumination but pays for itself by keeping the lights off when not in use.

Plant Layout—A business machine manufacturer who must keep many thousand parts in inventory has laid out stockrooms like city streets, and uses a numbering system that permits storekeepers to locate any part within 6 in., just by number. . . . An improved layout resulting from charts for each part reduced distance traveled 35%, production floor space 11%, storage area 44%, total production time, 20%. . . . Overhead outlet boxes provide immediate electrical connections after rearrangement of equipment, eliminate cost of moving or adding conduits. . . . Space has been saved, fire hazard lessened, in an airplane plant by replacing gas cylinders in the welding department with a piping system which brings oxygen, acetylene, and hydrogen directly to the benches from a separate, fireproof building.

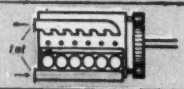
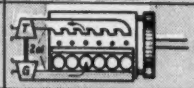
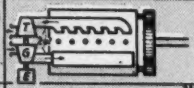
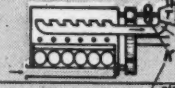
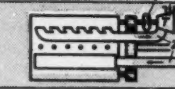
Preventive Maintenance—Time and money are saved by notifying the electrical maintenance crew when a machine is to be down for mechanical repairs, and vice versa, so that both types of work may go in at once, eliminating a second shutdown. . . . One factory finds it advisable to increase stress capacity whenever repairs are made on machinery or buildings. . . . A machine-tool builder reports that conferences of department foremen with maintenance foremen insure repairs which would not be disclosed as necessary by routine inspection.

Production Control—A 15% increase in production came from downtime analysis with a device, having a telephone-type dial, attached to machines to record cause and duration of delays. . . . One plant schedules 1 to 10 jobs a day for 170 machines on a visible board which indicates the total hours of work on hand for each machine, the job in process, and those ahead in the order in which they are to be run. . . . Required use of moving conveyor for "storing" all parts in process in one factory calls attention to any production difficulties when such facilities become inadequate.

Production Methods—Photographs or

CONSISTOMETER—A new apparatus for determining the consistency of cream-style corn, pancake batter, apple sauce, and preserves is a large metal disk engraved with 20 concentric circles increasing ¼ in. in radii. A steel truncated cone, open at both ends and fitting tightly against the innermost circle, is filled with the sample to be tested, then lifted vertically. After 30 sec. the extent of flow is measured at 4 quadrant points, and is converted to a consistency scale. —FOOD INDUSTRIES

SUPERCHARGING TWO-CYCLE ENGINES

Alternative		Arrangement	Reversibility
(I)	Not supercharged		fully reversible
(II)	Two stage supercharging		fully reversible
(III)	Supercharging set with additional drive		fully reversible
(IV)	Piston supercharging pump		limited power astern
(V)	Direct coupled supercharging set		not reversible

P = Scavenging pump T = Exhaust gas turbine G = Supercharging blower E = Electric motor K = Hydraulic coupling

Supercharging of 2-cycle diesel engines has reached the stage where, subject to long-term service experience, it may be considered practicable to operate at charging pressures of 28 to 43 psia. and bmep.'s of 170 to 215 psi. For these pressures, rotary compressors, if used, must be of multistage design. In general, simplicity of design dictates single-stage turbines, although multistaging might improve fuel consumption. The chart shows satisfactory arrangements for holding balance between turbine power, air requirements. —POWER

isometric drawings make details clearer to machine operators than do blueprints, and result in one manufacturers' getting fewer improperly machined pieces, especially during the early runs. . . . A stroboscopic device in a recording instrument plant reduced the time required to regulate the clock movement from about 2 weeks to 2 min. . . . Self-tapping screws eliminate inserts in parts of molded smoking set, increasing molding speed 30%, reducing overall assembly time by ½. (See also McGraw-Hill Digest, June, 1946, p. 6.) —FACTORY

BUILDING ON BEARINGS

To provide resistance to horizontal earthquake forces, and yet not to transmit any horizontal thrust on the old 6-story structure upon which 3 more stories were to be raised, engineers in California designed roller-bearing sets to support the additional 3 floors and used steel bars to carry the horizontal forces from each floor into an adjacent building. Each of the 65 bearing nests is 2 sets of rollers between 3 plates, the lower rollers being at right angles to the upper rollers. This arrangement permits as much as a 6-in. movement in any direction. —ENGRG. NEWS-RECORD

BETTER CAPACITORS

The life of paper capacitors has been increased 100 times by stabilizing the chlorinated impregnants with such compounds as anthraquinone. Addition of sulphur reduces electrical losses at high temperatures for capacitors with tinfoil electrodes and chlorinated impregnants. This forms a thin sulphite film between electrode and dielectric, preventing deteriorating interaction between the two.

Where the time constant of the capacitor circuit must remain fixed, resistances with a temperature coefficient of opposite sign can be used.—ELECTRONICS

CIGARETTE PAPER MADE FROM FLAX, NOT RAGS

As a result of technical developments started before the war, several U. S. mills are now making cigarette paper direct from flax fiber, instead of linen rags, the traditional practice.

Decorticated flax straw is cooked 5 hr. in alkaline liquor with 75-lb. steam pressure, the liquor drained off, and the pulp washed with hot water. In a cast iron breaker beater the raw stock receives a final washing and the fibers are cut to proper length for this phase of processing. The stock then goes to the bleaching system. Elemental chlorine is used in the first bleaching stage, caustic extraction is carried out in the second, and in the third stage the fiber is treated with hypochlorite.

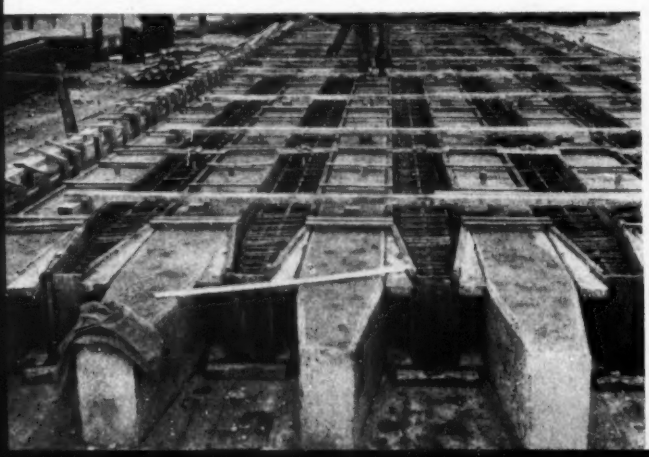
Wet weights of pulp in the bleach plant are determined by an electrically operated Weightometer which continuously totalizes the weight of fiber conveyed on rubber belts. This control, in combination with rapid moisture determination, permits the dry weight of the fiber to be determined quickly, accurately, and the correct amount of bleach liquor added.

After bleaching, the stock is vacuum-washed and the fibers are "frayed" (for easy interlocking in the paper sheet) by beating in Jones-Bertram machines made of tile-lined cast iron and equipped with stainless steel tackle. An electrically operated cam device permits the proper beating action to be reproduced, once the stock has been handled.

Water, broke, and filler (precipitated calcium carbonate) are added in a machine chest and the pulp agitated by a stainless steel ribbon. It then flows through a jordan which completes the refining operation, is diluted and mixed with white water from the paper machines, and centrifuged to remove foreign particles. A series of screen plates remove any pulp accumulation, and the completely dispersed pulp fibers then pass onto the fourdrinier wire of the paper machines. —CHEM. & MET. ENGRG.

BURIED-FAULT FINDER

A simple, reliable method of locating faults in both shielded and unshielded power cables is used by Pacific Gas & Electric Co. The approximate position of the fault is determined by d.c. resistance measurements. Then an impulse generator is connected to the cable and the exact position of the fault is located by a crystal vibration pickup and an electronic sound amplifier, the pickup being laid on the ground over the cable. —ELECTRICAL WORLD



ALTERNATE POURING—Using one set of precast concrete piles as form supports for a second set poured the next day gives low form costs in pier work in Virginia. After first forms are stripped, ¾-in. plywood liners are inserted. Screw anchors (screw bolts and spiral shells) are cast into pile at lift points; eyebolt screw replaces bolt for lifting. —CONSTRUCTION METHODS

LIQUID HONING

A new metal finishing process involves vapor blasting with novaculite, a siliceous rock abrasive as fine as 2,500 mesh per sq. in. Called liquid honing, the process of Vapor Blast Mfg. Co. is credited with adding strength as well as luster to the metals treated, with extending the life of a Chrysler die from 150 to more than 3,000 pieces, with reducing to ⅓ the number of times Goodyear tire molds require cleaning.

Essential liquid honing equipment includes: (1) a spray cabinet, (2) compressed-air equipment for blasting the spray emulsion (water-chemical-sand) at 3,200 ft. per sec., (3) the emulsion, used at a rate of 10 to 15 lb. per min. and recirculated.

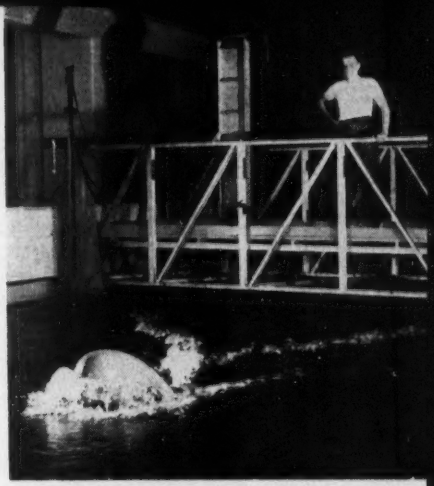
The minute peening effect of the abrasive is claimed to improve tensile strength 5 to 10%, and to produce a finely "etched" surface, with nondirectional finish, that holds and distributes lubricant evenly—on sleeve bearings, for example. There are 1,000 or more different emulsion compositions to fit various requirements. —BUSINESS WEEK

UMBRELLA HANGARS

New airline maintenance trend is reflected in TWA's $500,000 new 245x35-ft. Los Angeles nose hangar which shelters only forward sections of 3 *Constellations* or 4 *DC-3's*. If transports exceed size of *Stratocruiser* or *Constitution*, hangar housing may be abandoned for movable shelters covering only portions of plane. —AVIATION NEWS

PRECIPITRON PROVED

Now fully tested in 125 homes, the air cleaning device of Westinghouse Electric Corp. removes 90% of the dirt by drawing the air over 12,500-volt tungsten wires, then across charged metal plates. Safe and inexpensive, a refrigerator-size unit serves a 6-8 room house, has usually given relief to hay-fever and asthma sufferers. —ELECTRICAL MERCHANDISING



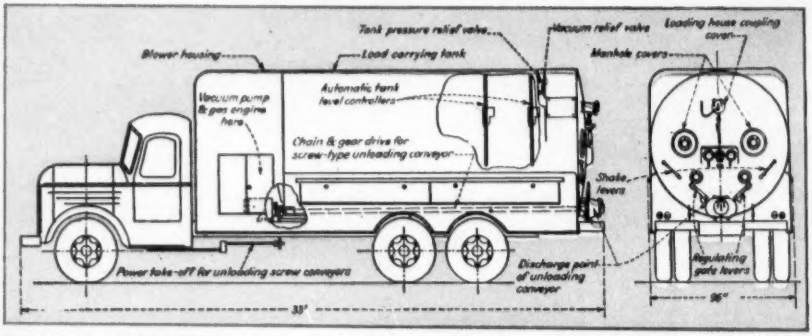
WATER "WIND TUNNEL"—Traditional procedure is reversed in the Navy's new model test basin. The ship stands still and the water is circulated past it and around a circular aqueduct at speeds up to 12 mph. by pumps whose motors develop 1,750 hp. 670,000 gal of water moves in the 22 ft. wide, 60 ft. long, and 9 ft. deep channel. Purpose is to determine new designs for fighting and commercial craft. —BUSINESS WEEK

BIG LITTLE SAVINGS

More than $1,500,000 a year in direct labor was saved by substituting a self-locking nut for a castellated nut and cotter pin in the manufacture of an automobile, thus offsetting the higher cost of the nuts. Another auto maker saved $2,000,000 a year by adopting standard lengths for bolts and screws. This increased the production runs on certain sizes or allowed commercial lengths to be used. —AMERICAN MACHINIST

AIR TALK RECORDED

To record 2-way conversation between planes in flight and radio stations, a voice-actuated, cellulose acetate film recorder, manufactured by F. Hart & Co., features 24-hr. recording time on a single loading, automatic starting and stopping, instantaneous playback without processing. Emergencies can thus be reenacted, helping to solve control-tower problems. The instrument is useful in telephone procedure. —AIR TRANSPORT



PNEUMATIC TRUCK LOADING—For transferring food products such as malt, sugar, cocoa, salt and nuts, the patented Holly system uses a vacuum pump and hose, thus eliminating costly manual labor, moisture spoilage, and lost time and material. The pump draws the product from the box car through a hose into the truck, and can be reversed to expel it into bins. For gravity unloading, a screw conveyor is provided. —FOOD INDUSTRIES

BEST WAY TO DETERMINE AMPLIFIER FIDELITY

Fidelity of audio amplifiers, especially those used in f-m. transmitters and receivers, is best determined by intermodulation tests. Two known frequencies are applied simultaneously to the input of the amplifier by a conventional signal generator. The output of the amplifier is connected to the input circuit of the intermodulation analyzer. When the input attenuator on the analyzer is adjusted until a carrier level meter reads 100%, the amount of distortion present is read directly on an intermodulation percentage meter.

In the intermodulation analyzer, the low-frequency component of the input is removed by an 800-cycle, high-pass filter. The remaining carrier (and sidebands) is then amplified to a predetermined level and demodulated. The reference level is obtained by adjustment of the input attenuator to the 100% carrier meter reading. The demodulator output is transmitted through a 200-cycle, low-pass filter to remove the carrier frequency and pass only sideband components up to 200 cycles. Since first and second intermodulation components generally are present in the distortion of a-f transmission equipment, it is essential that measuring equipment record many such components.

The ripple components, or intermodulation products, are amplified and then measured by a vacuum-tube voltmeter calibrated in percent of the total intermodulation. —ELECTRONICS

PHONES FOR AUTOS

Southwestern Bell Telephone Co. will offer three classes of radiotelephone service in St. Louis for vehicles: (1) two-way service between any vehicle and any regular telephone or other mobile unit; (2) two-way dispatch service between a customer's office and his own mobile units only; (3) one-way signaling service to mobile units to notify the driver that he should comply with prearranged instructions.

Charges for a 1-min., two-way dispatch will be as low as 15¢. If the telephone company provides the equipment for the vehicle, there will be a $25 installation charge and a $15 monthly service charge.

Construction of radiotelephone stations already has been authorized, or is pending, in all major cities of the United States. —ELECTRICAL WORLD

New Welding Techniques

Two- and three-tip torches produce better welds, faster, in thin stainless steel. Other improved tools and methods developed

Speed of welding stainless steel sheet to form aircraft-engine exhaust pipes was increased from 2½ to 7½ in. a min. by a 2-tip oxyacetylene torch developed by Ryan Aeronautical Co. The smaller outside tip preheats the metal to hasten welding, and the higher temperature attained with the 2 tips strips the flange from the assembly.

A 3-tip Ryan-developed torch incorporates a pair of natural gas tips, the gas being burned ahead and behind the oxyacetylene tip to pre- and post-heat the stainless steel concurrently with welding. Post-heating prevents too rapid cooling and cracking, and avoids oxidation since the gas protects the welded area from air.

To prevent oxidation of the internal weld seam in long, closed sections, natural gas is introduced into one end of the structure, the opposite end being sealed with wet asbestos.

Cobalt-chromium faced pliers align and hold the edges of a flange for spot tacking with a torch. A metal finger extends between the flanges for even alignment. A Ryan holding clamp is adjustable to any diameter, is mounted on a ball-and-socket swivel for turning to any position.

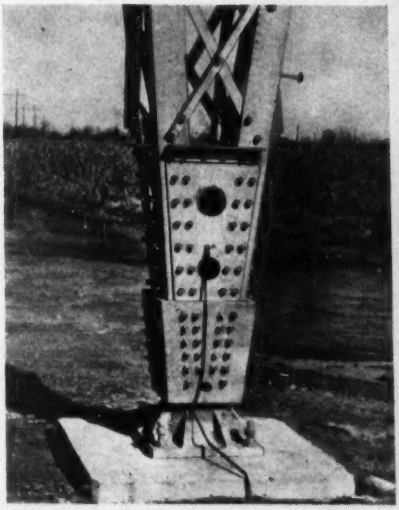
Ryan uses atomic-hydrogen welding for light-gage stainless steels, using electrode holders ½ conventional weight and a conveyor to permit automatic welding at 28 in. a min.

Exhaust-manifold production also was speeded by spot tacking the half-stampings together while manually holding them in alignment, prior to seam welding.

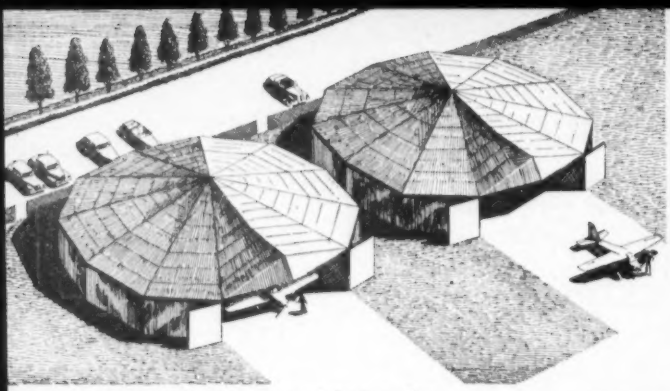
Unusual electrodes spot weld odd or difficult-to-reach assemblies. One is a large lower electrode of heat-treated steel with a copper insert, the high strength of the steel preventing deflection. The upper electrode is water cooled.

A long-type spot welding gun with a lever operated pressure device has been handy in spot tacking engine cowls. A solenoid switch control times the discharge current. Top-quality welds are made by flash-welding machines which bring 2 edges together butt-to-butt and establish an arc between them. A blanket of molten metal protects the plastic weld zone from the atmosphere.

Ryan uses the metal-arc process for fast, accurate welding of stainless. Varying the current gives precisely the cor-



STANDS ON ONE FOOT—Supported on one point, sideguyed, and topped by a "ram head," the 195-ft., 110-kv., single-circuit, lattice-work, river-crossing tower of Arkansas Power & Light Co. costs less than the footings alone for the conventional 4-footed tower. Bottom 35 ft. tapers to a ball resting in a socket on reinforced concrete. The tower supports a 2,480-ft. span of three 263,200-cir. mil. conductors and 2 shield wires. —ELECTRICAL WORLD



ROTO-HANGAR—Equipped with a pushbutton-operated turntable floor, the 6-plane 84-ft.-dia. steel airplane hangar developed by Roto-Hangar Co. saves hangar space and taxi area, requires but one set of doors, needs only one attendant. Each plane is housed in a triangular stall 40 ft. wide at the front, 11 ft. at back. —AVIATION NEWS

rect amount of heat for good fusion. But filler rods must be carefully selected so that added metal will not disturb the balance of the stabilizer or the carbon in the weld metal. —WELDING ENGINEER

CARBIDE CUTTERS SPEED ALUMINUM ALLOY MILLING

High-speed milling of aluminum alloys in wing and empennage spar caps led to these conclusions:

1. Only cemented-carbide cutters can be used for milling 14ST and 75ST alloys at high speed.
2. Solid-body cast cutters with cemented-carbide tips are practical and have the lowest initial cost.
3. It is desirable to keep above 6,000 sfpm. by using carbide-tipped cutters of 8-, 9-, or 10-in. dia. The higher the speed the better the finish, and up to 12,000 sfpm. is practical.
4. Copious quantities of coolant (1:20) are desirable on cutter work to lengthen time between brinds.
5. Cutter angles should be: helix, 10°; front rake, 5°; primary clearance, 7°; land, 1/64 in.; and secondary rake, 15°.

No advantage was discovered in the use of serrated jack blocks as compared with solid-body cutters, and the latter cost about half as much. Bodies were of Meehanite. —ELECTRICAL MACHINIST

DDT LIGHT KILLS BUGS

A wire screen coated with DDT crystals has a light inside to attract insects to their death at night. It is a development of D.D.T. Lite, Inc., which also will make snap-on insecticidal screens to fit incandescent lamp bulbs that are already installed. —ELECTRICAL WORLD

GIANT JET TRANSPORTS

Jet propelled, an 88-ton, 72-passenger airliner planned by de Havilland Engine Co. would cruise 615 mph. at 40,000 ft. Six could transport more trans-Atlantic passengers annually than the *Queen Mary*. Flight schedules would be ¼ of present; fare, ⅜.

The 4 turbojet engines will develop 5,100 hp. each on 0.88 lb. of fuel per hr. per lb. of thrust. Higher fuel consumption of the turbojet is more than offset by the high speed. —AVIATION NEWS

PINE-ROOT GASOLINE

At the end of the war Japan was producing 400,000 bbl. annually of 94-octane gasoline from oil extracted from pine roots. Although highly expensive, this oil became Japan's principal substitute for aviation gasoline. A catalytic process converted the unsaturated compounds to aromatics which, after adding TEL, yielded gasoline. —CHEM. & MET. ENGRG.

LARGEST DRYDOCK

The world's largest drydock—water volume 319,000 cu. yd.—was built at Cape Town in 18 months with concrete placed into traveling steel forms in successive monolith by cranes handling 2-cu. yd. buckets. The closure gate slides into an adjacent recess while an auxiliary floating caisson serves as an emergency gate or to subdivide the dock. Grouting was used for leakage sealing. The dock can be filled in 1½ hr. —ENGRG. NEWS-RECORD

VHF CABLE VELOCITY MEASURED IN 10 SEC.

Velocity of electromagnetic wave propogation through an ultrahigh-frequency transmission line is determined in 10 sec. by the VP Meter developed by the Naval Research Laboratory. It is only necessary to insert the prepared end of a line of predetermined length and adjust a single dial until a maximum indication is shown in the meter. The relative velocity of propagation is then read directly from the frequency dial or from a calibration table. Federal Telephone & Radio Corp. modified this design so that it may be used for a wide variety of sizes of coaxial and dual transmission lines.

In testing the velocity propagation of polyethylene-insulated transmission line, of which more than 2,000,000 ft. is made a month, the sample is cut to a length of 150 cm., or ¾ of a wavelength at about 100 megacycles. The relative velocity is determined as a direct function of resonant frequency. —ELECTRONICS

THERAPEUTICS FROM BLOOD

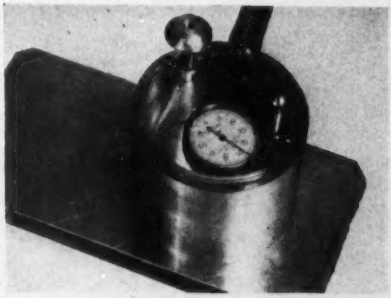
The closely related proteins of blood are separated, by fractional distillation, from alcohol-water systems at low temperatures and with accurate pH control in the Cutter Laboratories.

Chilled whole blood is centrifuged at 7,000 rpm. to remove red and white cells. The pH of the lighter layer (raw plasma) is adjusted to 7.0 with acid acetate, ethyl alcohol is added and fibrinogen settles out and is removed by centrifuge. The supernatant liquid, at −5°C., is adjusted to a pH of 6.8 and an alcohol content of 25%, at which a mixture of alpha-, beta-, and gamma-globulins can be centrifuged out, and from this mixture, in turn, isohemagglutinin and thrombin can be obtained by centrifuging at a pH of 5.4 and alcohol content 6.9%. Gamma-globulin, containing most of the antibodies in human plasma, and useful as a complete prophylaxis against measles, is separately obtained by centrifuge at pH of 5.2 and alcohol content 17%. The supernatant liquid obtained at the time of separation of the globulins yields albumin when the temperature is −7°C., pH 5.2, and alcohol content 40%.

Albumin is useful in treatment of shock, and a mixture of fibrinogen and thrombin forms a blod-clotting agent valuable in surgery. Isohemag-glutinin is a fast, potent reagent for typing blood. All the above products except fibrinogen are desiccated at −30° C. and the impurities volatilized out. Fibrinogen is filtered, agitated to a froth, and coagulated with thrombin, then desiccated and sterilized. —CHEM. & MET. ENGRG.

FUSELAGE AIR BRAKE

By installing retractable flat panels on the aft fuselage, Douglas engineers have overcome the disruption of the basic aerodynamic forces caused by other air brakes and created a new, simple, and highly effective aircraft control surface. In combination with flaps and slots, it may provide an extremely fast, yet safe, deceleration for landing multi-engine transports. —AVIATION NEWS



VACUUM THICKNESS GAGE—The thickness of sheet metal is measured by a vacuum-deflection gage developed by Glenn L. Martin Co. The gage consists of an inverted cup-shaped shell with a transparent top and a rubber gasket around bottom rim. Dial indicator inside shell measures sheet deflection, when a predetermined vacuum is attained inside the shell. Thickness is determined from deflection, the gage being calibrated for a specific material. Instrument is useful in testing bonds between layers of laminates. —PRODUCT ENGRG.

Supersonic-Wing Troubles

Wind tunnel tests reveal perplexing problems of structure, control, and stability with sweepback design. Landing speed excessive

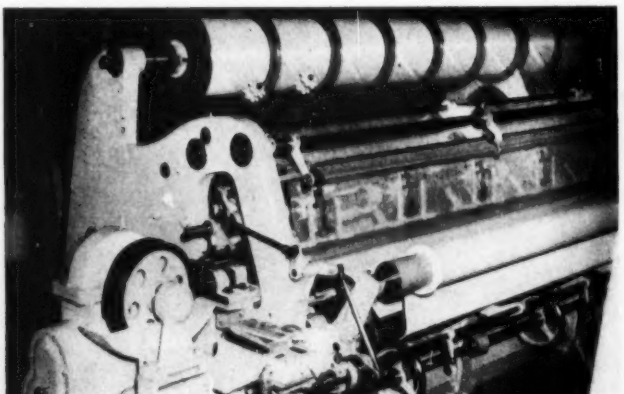
Hailed as a solution to trans-sonic flight, aircraft wings with a decided sweepback create enormous problems of structure, stability, and control which, in many cases, threaten to defeat engineers' attempts to penetrate the barrier to supersonic flight. High landing speeds, elimination of the rudder and elevators, and considerably greater demands on piloting skill seem certain.

Wartime wind tunnel research data just released, reveal: Large sweepback is required for trans-sonic flight, 65° being needed to traverse this zone and 72½° required for speeds above about 2,000 mph. Sweepback of less than 30° has little effect; 45° is minimum. Structural problems will make short, stubby wings a necessity, 55° being the maximum sweepback for rectangular wings, 65° for pointed wings.

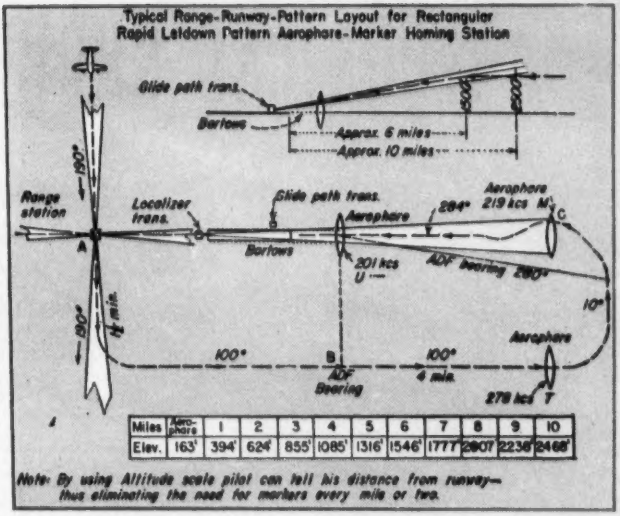
Flap effectiveness decreases with increased sweepback and is virtually useless in designs of 60° or more. Nose flaps, dropped leading edges, and slots were investigated, with the last showing the most promise on wings with less than 60° sweep.

High landing speeds appear a certainty with a premium on piloting skill. Sweepback adversely affects gliding angle to the extent that a 60° sweepback design with a 100-mph. landing speed (the minimum believed attainable) displayed a sinking speed of 75 ft. a second. The same landing speed with 45° sweep is accompanied by a sinking speed of about 50 ft. a sec., roughly twice the drop rate safely handled by an experienced pilot. The solution appears to be powered approaches with resulting increased landing speeds (150 mph. and higher).

Aileron effectiveness falls rapidly with increased sweepback. Swept wings ex-



FASTEST KNITTING MACHINE — Capable of producing 3.3 linear yd. of high-quality fabric 168 in. wide, the new Aveco Trico Knitting machine is the fastest in the world for its size. Large cams that provide smooth operation and lightweight moving metal parts to reduce vibration are credited with helping to make the high speed possible. Fiber rings fitted on ball bearings minimize noise and wear in the cams. —TEXTILE WORLD



SAFE LANDINGS—With this typical range-runway layout for rectangular rapid-letdown pattern, there are no weather conditions which make an instrument landing necessary. The aircraft carries 40 lb. of localizer, glide path and indicator equipment; the obstruction-free runway is equipped with Bartow lights, 2 or 3 Aerophares and localizer and glide path installations. The glide path is set and the angle fixed. The pilot receives constant visual indication, from glide path and localizer instruments, of heading and rate of descent and is thus brought safely down to visibility range of the Bartow lights.
—AIR TRANSPORT

hibit a considerably higher rolling moment, indicating a lessening of maneuverability for high-speed fighter craft.

Sweepback will demand greater directional stability, with a 45° sweep requiring at least 40% more fin area than a comparable straight-wing design. Most stable design for supersonic flight appears to be the triangular wing, with apex forward, which maintains its stability throughout the range of speed and flight angles predicted.—AVIATION NEWS

UNIQUE ANTIMONY OPERATION

In wartime Germany, non-ferrous metallurgy was characterized by very high recoveries of all values, with little regard for labor and reagent costs. In the recovery of copper and tin from scrap, flue dust was smelted to a solder which was marketed as such after kettle refining.

Overall recovery of antimony from flotation concentrates was claimed to be 98%. The ore was smelted, with the addition of 80% soda ash, 15% coal breeze from producer gas plant, for 4 hr. in a rotary furnace. Dust from the furnace was caught in baghouses. The slag ran 10-12% antimony and contained 10% of the antimony charged to the furnace. After weathering, the slag was smelted with coke to crude antimony metal. Arsenic was removed by resmelting the antimony in a reverberatory with sodium oxide and subsequently precipitating the slag in water. Iron was removed by the addition, in a rotary furnace, of raw sulphide ore to the sludge. The final antimony was found suitable for practically all purposes, even though it was not given a starred surface.

Little evidence has been found of recent research and development, aside from the light metals, in the non-ferrous group. —ENGRG. & MINING JOURNAL

TURBINES STANDARDIZED

To speed production, lower costs, simplify repairs and divert custom-designing efforts to developmental research, steam turbines are now being built in 6 standard models. The sizes, recommended by AIEE-ASME, range from 11,500 kw. to 60,000 kw. —BUSINESS WEEK

TECHNICAL SHORTS

Brakes Plane in Air—Covered by a patent assigned to B. F. Goodrich Co., a new aerodynamic brake for airplanes is an elastic sheet around the circumference of the fuselage. Inflating a tubular structure underneath causes the covering to assume a triangular cross section which increases drag to slow the plane. —AVIATION NEWS

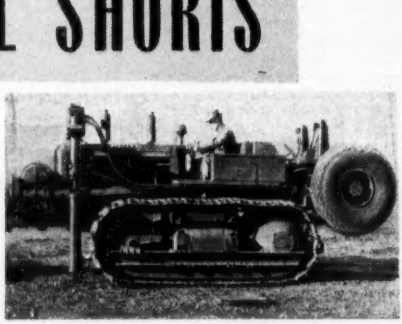
Cure for Sticky Dies—Sprayed or brushed on, liquid silicone compounds prevent molding materials from sticking to dies. The use of these to prevent food from sticking to pans is being investigated. —BUSINESS WEEK

Saves Bridges—Application of a 1/100-in. thick zinc coating to steel bridge members is expected to prevent, for 8 or 9 yr., corrosion due to salt spray. A patented "gun" forces zinc into a 1,600° flame to fuse the metal to the bare steel surface, prepared by grit blasting. —ENGRG. NEWS-RECORD

6-ft. Braze in Cast Iron—The 1-in. thick, 6-ft. long vertical web in each of 2 cast iron bases for mill rolls had been broken in shipment. But Weiss Welding Works successfully brazed the pieces together with the aid of a super-size preheater—burner using diesel oil under air pressure and shooting a 4-ft. flame. The pieces were beveled, aligned, one above the other, and tacked together with brazing metal. After preheating to a dull red with the big torch, each piece was laid on its side and 3 men brazed 3 sections simultaneously, equalizing stresses to prevent distortion, making the braze in 2 passes for each side. —WELDING ENGINEER

Prevent Rot, Mildew—Fungicide concentrates that can be applied during processing operations to control mildew or rot in textiles, lumber, adhesives, cordage, and similar products have been introduced by Nuodex Products Co. They include both microbiostatic and microbiocidal materials. Rope made of low-grade fibers has many uses when treated with the materials. —CHEM. & MET. ENGRG.

Rubber Saves Textile Rolls—The maintenance required by squeeze rolls in a slasher size box is reduced in a large textile mill by covering the rolls with synthetic rubber. Previously, the rolls were re-covered every 2 weeks, but the first rubber-covered roll has been in operation 7,100 hr., has been buffed for smoothing 3 times. —TEXTILE WORLD



TRAILER-TRACTOR—By hydraulically lowering the rear pneumatic tires and using the front jack to insert a 2-wheel dolly, this crawler tractor can be moved rapidly as a trailed load. —ENGRG. NEWS-RECORD

Abrasive Rubber—Neoprene synthetic rubber containing an abrasive is formed into tiny resilient pellets which smooth the rough edges of metal stampings, castings, and precision-machined parts. They also are used in tumbling barrels for deburring parts of brass, steel, or the light metals. —PRODUCT ENGRG.

Stratovision Tested—High-frequency radio broadcasts from an airplane flying at 20,000 ft. were received more than 120 mi. away in tests of "Stratovision" by Westinghouse; 50 mi. is the ground limit. —BUSINESS WEEK

Helicopter Sprayer—Experimental use of a helicopter for crop spraying and dusting near Yakima, Wash., may be followed by widespread application. The downdraft from the huge rotor is regarded as an asset, as is the hoverability of the craft. —AVIATION NEWS

Better Ore Bins—Capacity of ore-bins was increased 50-75 tons in Nevada by installing 6-in. H-beams within the concrete chamber beneath the bin, and facing these rows of beams with 3/8-in. plate held in place by gussets. Full feed can now be smoothly discharged to the ball mills no matter how low the ore level in the bins. Waste fill no longer displaces ore. —ENGR. & MINING JOURNAL

Pipe Bending for Warm Floors—By using 1¼-in. radiant-heating, wrought-iron pipe coils covered by 5-in. reinforced concrete slabs, warm, dry floors were insured and exposed radiators eliminated in new Pittsburgh houses. To cold-bend the pipe 180°, a machine was constructed from the hydraulic cylinder of a dump truck, actuated by an electric pump which was slung below trailer bed. —CONSTRUCTION METHODS

High-speed Propeller—Square-tipped propellers, with blades almost rectangular, are the result of aerodynamic research at United Aircraft Corp. No airfoil distortion is necessary, since the new tip carries the airfoil section for the entire blade length. A thinner, less cambered airfoil is used, giving reduction of compressibility. —AIR TRANSPORT

Glass Diaphragms—To replace hard-to-get mountain goat skin, diaphragms of fibrous glass have been developed for controls and instruments by Askania Regulator Co. They are nonporous, do not sag or stretch, resist attack by alkalis and acids, are said to have long life. —BUSINESS WEEK

Split Power—Tandem 80-hp. Franklin engines are face to face above and back of cabin, with propellers counter rotating, in the experimental 2-place personal airplane of A. C. Johnson and H. W. Funke. Elimination of torque, excellent cooling of second engine, high pilot visibility, and safe cruising on one engine are claimed. —AVIATION NEWS

Truck Pulls Poles Up—When a new pole is to be located in line with an existing pole line, Fosston Municipal Light & Power Co. raises it with a truck which pulls on a rope passing through a pulley at top of existing pole and fastened to pole to be raised (1/3 distance from top). —ELECTRICAL WORLD

Riveting Cabooses—Changeover from riveted to welded construction is becoming commonplace among railroad equipment manufacturers, as exemplified by the all-welded cabooses produced by Lincoln Electric Railway Sales Co. These are made of mild-steel sheets fused together with 5/32-in. general-purpose electrodes. —WELDING ENGINEER

Strong, Light Alloy—About half the weight of aluminum, an alloy of 75% beryllium and 25% aluminum is being used for strong, lightweight machine parts where cost is not a determining factor. —BUSINESS WEEK

Concrete Pipe Lining—Corrosion of shaft discharge column pipe by sulphur was prevented in Michigan by lining the 12-in. pipe with 3/8-in. layer of rich concrete. The pipe was prepared in 20-ft. lengths, by washing in kerosene, then alkali. The concrete was inserted by a 6-in. pipe, then rotation at 900 rpm. dried and bonded the concrete to the inside of pipe. —ENGRG. & MINING JOURNAL

Faster Plating—Alkane sulphonic acids may replace the poisonous cyanides now used in electroplating. They are 2 to 8 times as fast, produce brighter finishes. —BUSINESS WEEK

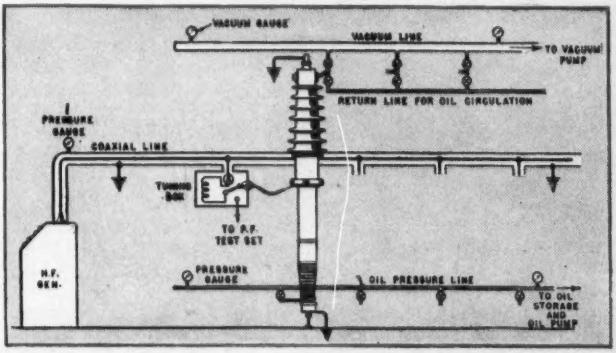
Explosion Holing—Detonation of explosive in chamber at top drives a rod 6 ft. down into clay and gravel soils. The 1x1¼-in. hole is then enlarged by exploding multiple strands of blasting cord. The rod is removed by a lever device. —CONSTRUCTION METHODS

Fiberglas Cuts Furnace Costs—Failure of induction furnaces at a U. S. naval gun factory was virtually eliminated by using Fiberglas cord EC5-8 as insulation in the ⅛-in. spacing between conductors. The mica flakes previously employed powdered out under vibration, created short circuits, and took the furnaces out of production so suddenly that the ceramic linings were damaged by quick cooling and had to be replaced at a cost of $3,500 a year. —ELECTRICAL WORLD

Crosswind Landing Gear—Two companies are experimenting with swivel undercarriage wheels for crosswind landing, under contract with CAA. British experiments with manually operated swivel wheels were successful, but the CAA wants automatic operation of the gear. —AVIATION NEWS

Ice Therapy—Navy doctors at Bethesda, Md., have discovered that by icing the arm for two hours before injection of penicillin they slowed circulation, reduced pain, prolonged the action of the drug so that fewer injections were needed. —SCIENCE ILLUSTRATED

DIELECTRIC DRYING—Drying time of high-voltage condenser - type transformer bushings has been reduced 8 to 10 hr. by dielectric heating at Westinghouse. Hot oil is admitted under vacuum, and 15 to 20 psi. impregnation pressure applied during heat treatment. A rise of 1° C./min. is obtained on a 115-kv. bushing with 4-kw. output from a 10-kw., 5-mc. generator. Moisture is carried off through vacuum line. —ELECTRICAL WORLD



Pay Should Be Relative

It is not so much what an employee is paid as how his pay compares with that of others doing the same class of work. Job evaluation is the answer

It is unfortunate that many industrial organizations have no systematic controls which permit equitable distribution of the sums of money available for wages and salaries. Consequently, disproportionate variations (of 200 or 300%) exist between the rates of pay of employees working on the same job, either within the same company or in the same neighborhood or industry. Such conditions become known to the employees concerned, it is impossible to justify them, and dissatisfaction results. In terms of power to cause dissatisfaction, the absolute amount of an employee's income is not so important as the amount relative to what others receive for the same class of work.

Job evaluation has the objective of seeing that each employee is equitably compensated on the basis of (1) nature of work performed, (2) the current competitive value of that type of work, (3) the effectiveness with which the work is performed. The latter is essentially merit rating, but all three should be considered jointly.

Job evaluation is as well accepted and as significant in the field of management as are time study and wage incentives. Of 51 well-known concerns surveyed, 36, or 70.6%, are using such a plan.

All job-evaluation programs fall into one of 4 basic categories: (1) ranking, (2) grading, (3) factor-comparison, and (4) point methods. In (1), a committee ranks all jobs from highest to lowest with respect to relative difficulty and responsibility. In (2), jobs are classified into groups or levels. In (3), jobs are ranked according to each of several factors, such as mental, skill, and physical requirements, responsibility, and working conditions. Under the point plan (4), the oldest and most frequently used, the relative worth of the job is evaluated by assigning to each a number of points (arithmetic units).

If those who evaluate the jobs are not experts, the point plan, in most cases, will be the most satisfactory because of its overall simplicity, objectivity, and salability to employees. Ten to 15 factors, such as skill, effort, responsibility, and job conditions are used. Then the number of degrees to be allocated to each factor is determined and each degree defined. Next, the weightings of the factors are determined and points assigned to each degree. The point total for each worker is his evaluation.—"Job Evaluation and Employee Rating," McGraw-Hill Book Co.

NEW ATOM SMASHER

Designed to accelerate electron "projectiles" to energies of 300 million electron volts, 3 times that of existing models of the betatron, a new type atom smasher is being built at the University of California.

The principle of this "synchrotron" is based upon the "theory of phase stability" which makes it possible to shoot projectiles around a circular orbit an indefinite number of times by having them always arrive at a given point exactly in time to receive an electrical acceleration. —CHEM. & MET. ENGRG.

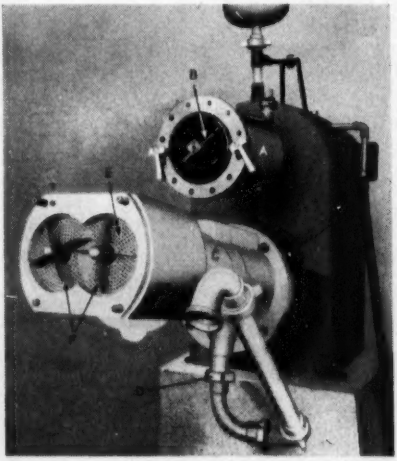
TELEPHONE LETTERS

Executives visiting, or located in, Chicago can telephone Workman Service, Inc., dictate letters to a recording machine, and have the letters transcribed and sent to them for signature within a few hours. This Dicta-Tel service supplements the calculating, tabulating, and other clerical work performed by Workman. —BUSINESS WEEK

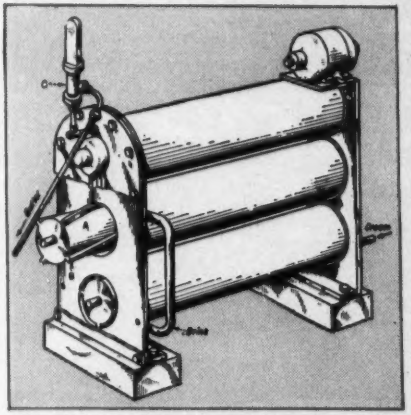
CONTINUOUS BUTTERMAKING

High-speed methods, disclosed in Germany, reduce labor costs and butterfat losses, produce good grade butter. In one system, the Fritz process, a special 1,000-lb.-per-hr. capacity churn is used. Cream (40-45% fat, temp. 42-50°F.) enters a 10-in. horizontal water-cooled cylinder where, in about 1½ sec., 4 high-speed (3,000 rpm.) dashers convert it to butter. The mixture of butter granules and buttermilk is then separated in a chamber by the action of two 18-in. long, 6-in. dia. screws rotating oppositely at 40 rpm. The butter is forced through a rectangular opening, then through perforated plates where it is worked by rotating scrapers. It is then extruded, ready for packing. This butter is 78-79% butterfat. Churns of 2,000- and 4,000-lb.-per-hr. capacity also were used, and labor saving is as high as 70%.

The Alfa process is a centrifugal separation of butterfat from hot cream in an air-tight separator, followed by a reversal, in a cooler, of the fat-in-water phase of the emulsion. The cream, concentrated in separators to 78-80% butterfat, is delivered at 150°F. by a variable-speed pump to the bottom of 3 cylinders mounted one above the other. Inside these 6-ft. long, 1-ft. dia. horizontal cylinders are rotating, spiral-ridged drums. The lower 2 are brine-cooled; the upper, water-cooled. In the center cylinder, the temperature is 48-50°F. and the fat-in-water phase becomes water-in-fat. Heated to 57°F. in the top cylinder, the butter flows into boxes for storage. After a few weeks in storage, the butter is 78% butterfat, with no free moisture. —FOOD INDUSTRIES



Fritz continuous butter-making machine partly dismantled, showing (A) water-cooled dasher cylinder, (B) dashers, (C) separating chamber, (D) outlet pipe, (E) perforated plates, (F) rotating scrapers.



Alfa continuous buttermaking machine, broken to show (A) rotating drums, (B) spiral ridges, (C) pressure screw to regulate water content of butter.

HOT BASEBOARDS

Finely corrugated, heavy aluminum baseboards, backed by 3 x 11 x¼-in. heater units wound with resistance wire embedded in ceramic have given promising results in house temperature and humidity control. The asbestos-covered units are backed by aluminum-foil reflectors. Bellows-type thermostats are used for control. Average demand for a 10,600 cu.-ft. house is 5 kw.—ELECTRICAL WEST

WINGS SIMPLIFIED—One-piece stamped-out aluminum ribs in the wings of the new low-cost Aeronca personal planes are typical of production advances. As late as 1940, wood wing-ribs, made of 60 pieces laboriously assembled in a jig and glued together under pressure overnight, were used. —AVIATION NEWS

STATIC SAVES PAINT

The amount of coating material used can be reduced 40 to 60% by conveying the parts through an electrostatically charged field while their surfaces are sprayed with atomized finishing material. High precipitation efficiency is obtained because the finishing material, upon entering the charged zone, becomes charged the same as the electrode system and is therefore repelled from the electrodes and attracted toward the electrically grounded parts being coated.

The electrode system normally consists of frames assembled from ⅜-in. diameter steel rod and tee and angle fittings, 30-gage copper wires being stretched across these frames at intervals. Distance between wires and surface to be coated is 12 to 18 in. Usually, an electrode frame extends about 4 ft. along each side of a grounded conveyor carrying the parts to be coated.

The electrode system is connected to a rectifier delivering a d.c. voltage pulsating from 0 to 100,000 volts every 60th of a sec., the rectifier in turn operating from a 220-volt, 10-amp. single-phase, 60-cycle, a.c. line. Only about 0.4 milliamp. passes through the field.

Fumes from the sprayed coating are fan-exhausted from a metal enclosure around the spray area, this enclosure also protecting workmen. Nonconducting parts must be in metal fixtures.

Automatic spray guns are positioned about 1 ft. from electrode system and aimed at an oblique angle to the path of conveyor travel. —AMERICAN MACHINIST

MANAGEMENT IQ's

It is easy, even tempting, to the more sophisticated members of management to dismiss labor's pamphlets and other publicity materials as "corny," or amateurish. They are—just about as "corny" as the average worker's sense of humor and his tastes in general. Result—they get read, and if current events can be relied upon as evidence, they get believed. Management's copy, on the other hand, can't seem to get "corny" without getting patronizing. Principal reason is that employers and their publicity men seem to be victims of the old cliche about the average worker having the IQ of a 12-year old. It might be more accurate to say that the average 12-year old has the IQ of an adult. Several of the International Ladies Garment Workers Union's excellently written pamphlets are inscribed "To the workers, who are seldom ignorant . . . but frequently uninformed." —FACTORY

LITTLE GAS TURBINE

Considerable savings in weight and space over reciprocating engines is attained by the new Westinghouse gas turbine auxiliary power plant for aircraft. One model drives a 24-kw., 30-volt d.c. generator and a 2.5-kva, 120-volt, 400-cyc. a.c. A later design will operate a 40-50-kva., 400-cycle a.c. and 20-volt d.c. generators. Heavy, bulky converters are eliminated. —AVIATION NEWS

Better Bus Maintenance

In shops of bus transportation companies, modernization and re-equipment are cutting costs, reducing failures, and preparing the industry for wide expansion

One bus company has used 3,100 gal. of paint in scientifically redecorating the repair shop for safety and comfort. Ceilings, steel framework, and pits are white; upper walls are light green, lower walls, dark green; immovable parts of machinery are vista green, movable parts, ivory; control levers and handles are yellow; electric switches, red; cranes, hoists, and trucks, beige. Brighter and cleaner, the paint has boosted morale and reduced accidents. The parts-cleaning room of another company, brightly painted, has highly glazed tile walls and a metal grill over the floor.

Automotive shops are now installing many types of cranes to reduce the heavy manual labor of the shop worker. Overhead monorail cranes, stationary pillar cranes, tractor-driven power cranes, all make work easier and faster. Dollies, carts, and portable jacks are similarly finding wide use.

With a fleet of 1,000 vehicles, a company has established a special department for each type of repair work, thus permitting an efficient layout, saving time in equipment moving, and allowing men to become proficient at one job. The shop is divided into bays, each bay bordering on its section of the stores department.

Interconnected T-shaped engine pits are each equipped with engine-oil drain pipe, high- and low-pressure lubricating lines and ducts to draw out exhaust fumes. Air-pressure lines are provided for operation of tools, and the pits are fluorescent lighted. One company constructed small shallow pits at intervals, parallel to the inspection pits along which the coaches move on their regular weekly trips through the shop. From the shallow pits, inspection and repair of the control mechanism is most convenient.

Another company uses the unit system of overhaul and replacement. With the aid of oil and grease analysis, plus engine and vehicle dynamometers, skilled supervisors keep maintenance cost low. The training program is aided by descriptive material and charts placed in large, swinging frames on the walls. Production has been raised by as much as 50% by automatic shut-off valves for gasoline hoses. These valves allow the employees to check oil, water, batteries and tires while tank is being filled. A dynamometer, reproducing actual road and load conditions, aids in detecting many power-plant defects. An engine

Rear wheels of bus drive dynamometer rolls in test.

break-in dynamometer seasons and correctly adjusts an overhauled power plant before it is placed in the vehicle.

The maintenance base of a Pacific Coast company completely rebuilds between 90 and 100 engines each month, in addition to at least 100 lesser engine jobs. Here a second cylinder grinder renovates 1 cylinder every 45 min. Another machine regrinds 4 crankshafts a day, and a lathe attachment grinds cams after being built up by arc welding.

A system of analysis of work failures gives one company a complete check on personnel in the maintenance plant. When a vehicle is "pulled in" for any reason—mechanical or management—a full investigation places the responsibility on the proper individual. Because of honest opportunities for airing grievances, this company has an enviable record of efficiency. —BUS TRANSPORTATION

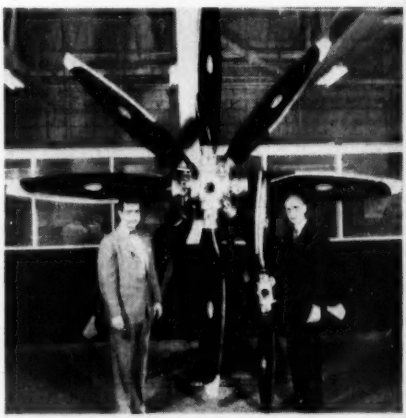
2-BEAM C-R TUBE AIDS BIOLOGICAL RESEARCH

Development of the new 2-gun, or 2-beam, cathode-ray tube provides a significant new tool for biological research, since it permits simultaneous observation and recording of 2 or more fast transient phenomena such as nerve potentials. This tube differs from the British single-gun, split-beam tubes in the possibility of independent beam modulation and horizontal deflection as well as push-pull vertical deflection.

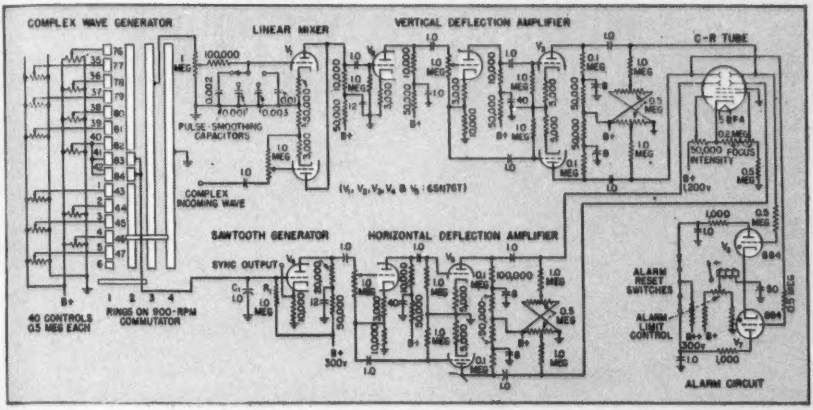
Probably the most common situation in which dual-channel, cathode-ray recording will be used is in the simultaneous checking of 2 points within the same system. An essentially qualitative comparison of the nature of electrical activity at locus *B* when locus *A* is active in a certain pattern is a common problem. Sometimes a more quantitive comparison may be needed, such as the voltage at locus *A* in relation to that at *B*, or time relations between these points. The dual-beam c-r tube lends itself especially to the determination of time or phase relations or transients requiring time axes expanded too greatly for convenient moving-film (mirror galvanometer), ink-writing, or electronic-switch recording. Here the triggered sweep is used, initiated by an outside source bearing some relation to the transient or initiated by the transient itself. —ELECTRONICS

DRY ICE RIFLE

Rifles using dry ice as a projectile propellant are to be made by Parr Instrument Co. The solid carbon dioxide is held in the magazine, and ½ lb. will fire 1,000 rounds of .22. A tube connects the magazine to a conventional barrel, and the trigger opens a valve to allow carbon dioxide gas to expand rapidly into the barrel and force out the bullet at high velocity. A dry ice .22 maintains pressure of 1,200 psi. at room temperature, but to get higher pressures for larger guns, the magazine must be heated. Equipped with a magazine holding 200 to 300 lb. of dry ice, it is claimed that a heavy artillery piece could fire continuously for 9 hr. —BUSINESS WEEK



HIGH-POWER PROPELLER—Developed for 2,500-hp. aircraft engines, Aeromatic's giant new 8-blade, contra-rotating propeller is of high-strength, plastic-bonded plywood covered with hard Aerofoid plastic. Pitch-changing is accomplished by natural physical forces during rotation, as it is in the little 200-hp. propeller. —AVIATION



Circuit diagram for panoramic frequency-monitoring system which cancels old signals on screen of cathode-ray tube to permit easy detection of frequency changes or arrival of new signals. It also sounds an alarm.

ALARM INDICATES SHIFT IN RECEIVED FREQUENCY

When a band of frequencies in the radio spectrum is to be monitored with a panoramic receiver, it is often desirable to cancel some, or all, of the signal pips appearing on the cathode-ray tube screen after they have been recognized. This reduces the trace on the screen to a horizontal line so that the arrival of a new signal or a shift in the carrier frequency of one of the original signals will be noted instantly. A further goal is means for setting off an alarm automatically when a frequency shift occurs or a new frequency arrives.

All of these requirements are met in a complex-wave generator and electronic alarm developed by RCA Laboratories. The radar, sonar, or panoramic receiver output is mixed with the output of the complex-wave generator and the resultant voltage fed to the deflection plates of a cathode-ray tube for visual observation of the canceling process. 40 controls on the wave generator are adjusted in sequence to make the pattern on the c-r tube screen drop to zero step by step, as pulses of opposite polarity are introduced to cancel each portion of the original observed pattern. The resultant trace is, for practical purposes, a horizontal line, so that the new signals or frequency shift instantly produce recognizable deviations.

The alarm indication is obtained by connecting the grid of a thyratron to each vertical deflecting plate of the c-r tube, so that a new or altered signal on either plate triggers a thyratron and operates a relay. —ELECTRONICS

RUBBER CHEMICALS

A series of Darex copolymers made by Dewey & Almy Chemical Co. have proved to be good processing aids and compounding ingredients and are said to improve: abrasion resistance and flexibility of GR-S and natural rubber shoe soles and top lifts; hardness and tensile strength of molded semi-hard rubber electrical and automotive parts; dielectric strength and moisture resistance of GR-S, GR-I, and GR-M wire insulation; and the rate of extrusion and movement in thin-walled GR-S tubing and in Neoprene hose. —CHEM. & MET. ENGRG.

NEW PRODUCTS

BALL BUSHING—Antifriction bearings for linear motion in circular shafts have been developed by Thomson Industries, Inc. A similar "ball bushing" for square shafts is under development. —ELECTRICAL WORLD

Moisture Meter—Moisture content of sheet materials is quickly determined and indicated on a dial by the new Model S electrical detector of Colloid Equipment Co. The sheet (up to ⅝ in. thick) is inserted between 2 long electrodes. Power supply is 110 volts a.c. —CHEM. & MET. ENGRG.

Clock Controls Appliances—Electric appliances drawing up to 1,650 watts are turned on and off at preselected times by the Select-O-Switch developed by General Electric Co. It is a clock-like controller, with control-time setting buttons circled around the dial, 4 for each hourly interval. —ELECTRONICS

Cold Controller—An improved control valve for small mechanical refrigerators eliminates heavy overload on the compressor motor during starting. Refrigerant pressure built up during the "off" cycle closes the valve until evaporator pressure is reduced after the compressor starts, then control shifts from pressure to superheat. Developed by Alco Valve Co., the valve has interchangeable pressure-limiting bellows. —FOOD INDUSTRIES

Bimetallic Watt Meter—In a new thermal watt-demand meter of General Electric, temperature-sensitive bimetallic spirals, attached directly to a shaft and gear, act as their own heaters. The heat produced by electric flow causes the spirals to deflect, rotating shaft and gear to move a red pointer. Maximum demand is indicated by a black pointer pushed upscale by the red. —ELECTRICAL WEST

Portable Stroboscope—Employing a self-blocking oscillator in its circuit, a stroboscope of Communication Measurements Laboratory covers speed ranges from 600 to 48,000 rpm. A synchronized reed provides accurate calibration against line frequency, and all 4 scales can be calibrated within 3%. The light source is in a probe attached to a 4-ft. flexible cable. —ELECTRICAL CONTRACTING

Double-pane Windows—Two or more plates of glass enclosing a ¼- to ½-in. hermetically sealed insulating dead-air space are separated by hollow aluminum tubing and framed with light-gage stainless steel channel in the Twindows developed by Pittsburgh Plate Glass Co. A desiccant drys the air between the glass. —BUSINESS WEEK

Fingerprint Neutralizer—Highly polished steel parts are protected during production by the Cosmoline fingerprint-acid neutralizer developed by E. F. Houghton & Co. Its water-displacing property also protects the part against rusting after being ground with a water-soluble coolant. 1 gal. covers 1,500 sq. ft. —AMERICAN MACHINIST

Magnesium Truck—Weighing but 26.6 lb. and balanced so that it automatically falls forward when unloaded, a new general-purpose hand truck is made of cast magnesium alloy by Magnelux Mfg. Co. —TEXTILE WORLD

Out-of-line Coupling—Misalignment of 2° on either shaft, or a total of 4°, is permissible with the shaft coupling of Barcus Engineering Co. It comprises a cylindrical housing cut with internal gears having stub teeth with a 20° pressure angle. Driving and driven shafts are connected to hubs of gears cut on a central segment of a sphere. The teeth of each spherical gear meshing in the stub teeth of the housing produce a smooth ball action to reduce friction and pressure on shaft bearings if shafts are out of alignment. —MILL SUPPLIES

Speedy Finish-filler—Packages partially filled with free-flowing commodities by volumetric or rough-weight fillers are finish-filled by an automatic weight adjuster developed by Fred Goat Co. 1-lb. packages pass at 60 a min. through a series of stations at which progressively smaller increments of material are added if the weight is below the preset value at a station. —CHEM. & MET. ENGRG.

Vibration Absorbers—90% effective, inexpensive shock mounts for personal airplanes are built on war-proved principles by Robinson Aviation, Inc. They include a coil mainspring, 4 flat springs to stop low-frequency oscillation, 3-way shock-load snubbers, and a load-carrying stud. —AVIATION NEWS

Dictation on a Ribbon—An electronic dictating machine introduced by Meter Reproducer Co. uses a ⅝-in. ribbon of spool-wind film on which dictation is recorded by a needle. With room for 100 sound tracks, a roll of film records for 33 hr. A number dial quickly selects the track for playback, this being supplemented by a footage dial.—ELECTRON.CS

Fluxed Welding Rod—A new bronze welding rod is precoated with Brazo flux plus a nonactive binder that adheres firmly without burning off ahead of the rod. Manufactured by Linde Air Products Co., for application by the oxyacetylene process, the rod can be heated, bent or exposed to weather without damage. —COAL AGE

Air-hydraulic Power—The fast, economical, operation of air is combined with the smooth regulation of hydraulics in the new Air-Draulic power cylinder of Logansport Machine Co. Separate air and hydraulic pistons are on a common rod, the former providing the power, the latter pushing fluid through an adjustable speed-control valve in a bypass circuit. AMERICAN MACHINIST

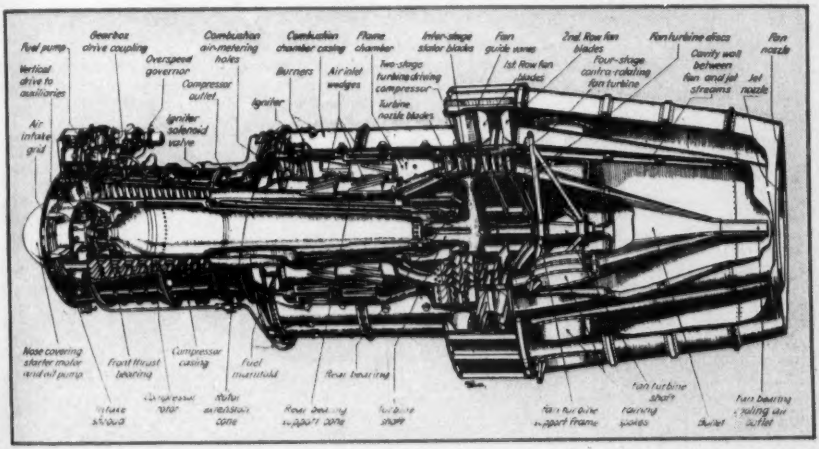
All-purpose Hole Cutter—Smooth holes of 1⅛- to 8-in. dia. are cut quickly in hard materials (like steel) ¼ in. thick or in soft materials (as plastic or wood) 1½ in. thick with the new adjustable cutter of Bruno Tools. The blade is mounted on the end of an arm that is rotated by the spindle of a tool such as a drill press. —MILL SUPPLIES

Prevents Hot Journals—Designed to prevent waste "grab" and resultant hot boxes, the spring-loaded Gorman waste retainer has been tested on the Louisville & Nashville R. R. The squeezing action assists oil flow to improve lubrication. —BUSINESS WEEK

Wet and Dry Iron—A finger-operated adjustment converts the steam iron of Monitor Equipment Corp. to a dry iron. It holds ½ pint of water, delivers steam (75 sec.) only when horizontal. —ELECTRICAL MERCHANDISING

No-static Linoleum—To avoid the hazards of static electricity in plants where explosive materials are present, a nonsparking, highly conductive linoleum has been introduced by Congoleum-Nairn. —FACTORY

Add-a-page Binder—If the new pressure-sensitive adhesive binder strip of Add-A-Page, Inc., is stitched into a catalog when it is published, new pages, or even photographs, can be added without punching, moistening, or gluing. Cloth protects each edge of the ¾x11-in. strip until ready. —BUSINESS WEEK



FAN THRUST BOOSTS JET — Thrust augmentation through the use of turbine-driven contra-rotating fans that deliver a cold stream of air to the jet outlet through a duct around the hot jet stream is a feature of the new British Metropolitan-Vickers F-/3 turbojet engine. It develops 2,400 lb. static sea level thrust for a weight of 1,650 lb. from the hot jet and, with fan augmentation, a thrust of 4,000 lb. for a weight of 2,200 lb. This gain in thrust is attained without using more fuel; specific fuel consumption is 0.65 lb./hr./lb. thrust. —AVIATION

NEW PRODUCTS

Gearless Pump—For pumping liquids in either direction, ECO Engineering Co. has developed a gearless pump employing double impellers made of several layers of pressure-vulcanized, laminated material. The impellers pass grit or sludge without stalling, jamming, or stripping. Capacity varies from 7.5 gpm. at 600 rpm. to 23 gpm. at 1,800. —FOOD INDUSTRIES

Cool Metal Rectifier—Rated 50 amp. for 6-volt automotive battery taper charging, copper sulphide disk rectifiers of Benwood-Linze Co. do not require cooling. Two may be operated in parallel from separate transformer secondaries to carry 100 amp. without a fan. —ELECTRICAL CONTRACTING

Tapping Screw for Plastics—Designed for making fastenings in comparatively thin, friable, and brittle plastics, a new self-tapping screw has 5 cutting flutes to distribute pressure evenly and coarse threads to hold displaced material. It is a Parker-Kalon Co. development. —MILL SUPPLIES

Chemical-proof Clothes—Imperviousness to oil and greases, and high resistance to acids and alkalies, is claimed for the new buff-colored, neoprene-coated coverall introduced by Benson & Associates to protect workers. Weight under 3 lb. —CHEM. & MET. ENGRG.

More Efficient Power Tube—United Electronics Co. has incorporated the new Isolated Getter Trap in its 300-watt V-70-D graphite anode power tube. This confines the getter material within a small glass container in the tube and permits clear glass to be used in the envelope. The mirror-like bulb coating is eliminated, increasing tube efficiency 10-20%. —ELECTRICAL WORLD

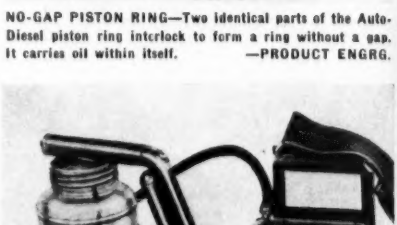
Self-sealing Rivet—A structural contribution in the trend toward commercial pressurized-cabin flight, the Keg rivet has a concentric hump on the underside of the head. This deforms on driving to provide enough surplus material for tight contact. —AVIATION

Shortens Plane Landings—The center of gravity of an airplane is shifted toward the tail to prevent nosing over, when brakes are applied heavily at high landing speeds, by a new accessory made by Aircraft Devices. A weight released by the pilot travels on ball bearings along an inclined track extending from the C.G. into the tail. —AVIATION

Machine Operates Machines—With the electro-pneumatic controller developed by Electro-Air Devices Co., standard machine tools and fixtures can be converted to automatic production units. The device uses Micro Switches for machine and fixture contacts, air pressure to operate. —BUSINESS WEEK

Rubber Paint—Developed for walls, roofs, or floors of concrete, brick, stucco, paper, wood, or metal, Rubbermastic paint is said by Guaranteed Products to adhere to any surface—wet, dry, painted, or unpainted, inside or outside—with no etching or preparation. It is claimed to have welding qualities that effect a vulcanized water-proofing job in a variety of colors. —FACTORY

NO-GAP PISTON RING—Two identical parts of the Auto-Diesel piston ring interlock to form a ring without a gap. It carries oil within itself. —PRODUCT ENGRG.



STRAP-ON SPRAYER—Directly coupled to the shaft of a small 110-v., universal, motor, a tiny rotary compressor supplies air to the jar-mounted adjustable paint spray nozzle of Lowell Mfg. Co.'s new Thoro-spray. Total weight is but 8 lb., and the motor-compressor is carried on a strap over the painter's shoulder. —BUSINESS WEEK

FOR MORE INFORMATION

inquiries will be welcomed from readers who desire additional facts about any of the items in this issue.

Write to:

The Editor
The McGraw-Hill Digest
330 West 42nd Street
New York 18, N. Y., U. S. A.

Metal Disintegrator—Operating on the electrical arcing, or sputtering, principle the improved metal disintegrator of Drafto Corp. quickly cuts a hole in broken taps or drills to permit easy removal. Round, hexagonal, and square electrodes, or special shapes, are available for drilling hard metals with the tool. —POWER

Variable Vacuum Capacitor—In a new vacuum capacitor introduced by Jennings Radio Mfg. Co., 7 revolutions of the shaft vary the capacitance over the full range (50 to 250 mf. in 1 model), without vernier. —ELECTRONICS

5-pressure Cooker—The 4½-qt., cast aluminum-alloy Karen pressure cooker has dial settings for 5 pressures, and an automatic safety release. —ELECTRICAL MERCHANDISING

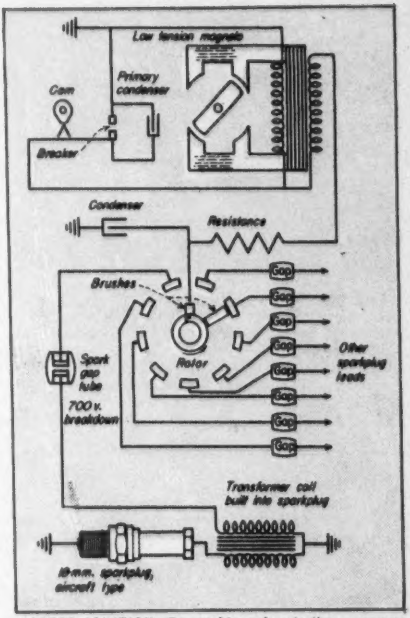
Aluminum Stepladder—Weighing but 16 lb. in the 5-ft. size, folding stepladders made entirely of aluminum alloy 52S (tensile strength, 37,000 psi.) have been offered by Aluminum Ladder Co. —CHEM. & MET. ENGRG.

New Stadium Light—To keep out rain, dust, and insects, the edge of the aluminum reflector is spun over the rim of the glass of the Yankee Stadium 750-1,500-watt floodlights developed by General Electric Co. A detachable socket housing provides access to the lamp without changing its position. The light is aimed by sights on reflector and housing, and there is a pointer, a degree scale, and it also carries a repositioning stop on one trunnion. —ELECTRICAL WORLD

3-Way Squeeze Valve—Employing a flexible, molded synthetic rubber tube, the Flextube nonmetallic 3-way valve is designed for handling highly corrosive fluids. The straight-flow characteristics of this new Grove Regulator Co. valve adapt it to viscous or solid-carrying fluids. —FACTORY

Aluminum Bath Basin—Cast in a sand mold in one piece, the lightweight aluminum Northrup Aircraft showerbath basin cannot leak. The baked-on crackle enamel finish (said to be slip proof) is supplied in various colors. Installation time of the 1 sq. yd. basin is about 30 min. —BUSINESS WEEK

Quick Capacitor Checker—Intermittent open-circuited and short-circuited capacitors are located, without unsoldering them from the electrical circuit, by means of a Quick-Check oscillator circuit in the new Model CF Examiner introduced by Solar Mfg. Corp. The instrument contains a d.c. bridge to check 10- to 2,000-mf. capacitances and 100-ohm to 7.5 megohm resistances. Capacitor power factors up to 55% are read on an auxiliary bridge scale. Capacitor insulation resistance and electrolytic capacitor leakage current also are measured. —ELECTRICAL WORLD



HOTTER IGNITION—To provide easier starting, overcome sparkplug fouling difficulties, eliminate corona effects, and raise operating ceilings, a new ignition system for aircraft has been developed by GM's AC Spark Plug Div. A low-tension magneto supplies current to a brush-type distributor head, a breakdown tube (set for spark jump at 700 volts), a miniature step-up transformer (encased in the ceramic insulator of the sparkplug), and the plug electrodes. Electrical energy generated by the magneto is stored in a condenser until great enough to jump the tube spark gap and deliver a surge of current to the plug transformer. Engines with this ignition system have operated 500 hr. without cleaning or regapping of plugs. —AVIATION

10-range Voltmeter—Designed by General Electric Co. especially for lab and industrial electronic testing, a new vacuum-tube voltmeter has 10 push-button calibrated ranges from 10 millivolts to 300 volts. It can be used between 10 to 15 cycles, and 1 to 1.5 megacycles. —ELECTRICAL CONTRACTING

Forceful Feeder—A chemical solution can be fed into a process against pressures up to 5,000 psi. at a constant adjustable rate of a few cc. to 10 gal. per hr. by Lapp Insulator Co.'s DEL Wilson Pulsafeeder. It has a direct-motor drive and a positive-displacement, reciprocating diaphragm proportioning pump. —POWER

ELECTROCUTES WEEDS—Electrodes of Gilbert Baker's Electrovator send 12,400 volts a.c. through stalks of weeds, into root systems, and through soil to other electrodes, withering the weeds by destroying their cell structure. A 21-hp. gasoline engine drives a 10-kva. generator to supply, through a transformer, 0.75 amp. at 12,400 volts. Two treatments 20 days apart are recommended for a thorough job. —ELECTRICAL WORLD

MATCH OPERATES FIRE DETECTOR AT 60 FT.

Although extremely sensitive to the light rays from flames, electric sparks, and arcs, a new electronic fire and flame detector is not affected by daylight or artificial light. A burning match operates it at 60 ft.

There is essentially no energy below 3,000 Angstroms in daylight, or diffused sunlight, as the earth's atmosphere absorbs most of it. In artificial light sources, the glass enclosure eliminates radiation below about 3300 Angstroms. But in the case of unprotected flames or sparks, the radiation is not impeded and is utilized to operate the fire detector.

A Geiger-Muller tube which responds only to ultraviolet light is the sensitive element of the detector, this tube having a special glass envelope allowing about 80% transmission at a wavelength of 2600 Angstroms. Sensitive in all directions, the tube has a cathode cylinder of copper screen.

As soon as the average pulse rate of the tube output reaches a predetermined value, a relay is operated by an electronic circuit connected to the tube. This circuit applies a charge to a capacitor-resistor combination for every pulse received, thus essentially averaging the pulse rate over a time interval. The potential developed controls a thyratron relay circuit which, in turn, operates the alarm device. —ELECTRONICS

LOOM WEAVES OR KNITS

Recently reintroduced by Robert Reiner, Inc., the Kayloom combination weaving and knitting machine employs warp and filling yarns as in weaving, but instead of interlacing the two systems of yarns it ties a knot around their intersections, using a knitting stitch. Depending upon the selected inter-relationship of warp and filling yarns, the fabric can be made to resemble either woven or knit goods, but the machine is designed to produce fabrics different in appearance and character from either woven or knit materials. It is claimed that stretch can be limited to that existing in the yarn only.

Pattern control is said to permit wide variations in design, making possible warp or filling stripes, plaids, and checks on the square or diagonal. Fabrics can be made open and porous, yet remain free from slippage, it is stated. Warp tension, controlled by brakes, is reported to be so low that end breakage is practically eliminated.

The standard 128-in. machine will form a single width of 120 in., 2 of 60 in., or 3 of 40 in., all of these widths having fast selvages. —TEXTILE WORLD

NUTRIENT SYNTHESIZED

One of the nutritionally essential amino acids, methionine, has been synthesized in a new commercial process of U. S. Industrial Chemicals. This development is expected to reduce the cost 97% (it is now several hundred dollars a pound) and make the product available for many important medical uses (it is particularly valuable in treating liver disorders). Methionine is found in various proteins. Dairy products, fish, and liver are the best sources. —CHEM. & MET. ENGRG.

CRYSTAL RECTIFIERS HAVE MANY ADVANTAGES

A new, efficient rectifying device—necessary for radar and of increasing usefulness in commercial microwave applications—is provided by recent developments in the manufacture of germanium and silicon crystals. Basic improvements in stability and performance may enable the crystal to displace the diode in many applications, particularly because of its effectiveness at high frequencies. But even at low frequencies, certain kinds of crystals may prove more stable, have less weight, and take up less space than a diode and filament transformer.

A modern crystal rectifier consists of a small-area contact between a metal such as tungsten and a suitable semiconductor such as galena, germanium, or silicon. These differ from a copper oxide and selenium rectifier in having a small contact area and usually a smaller power-handling capacity. On the other hand, their reduced capacitance makes them very useful at high frequencies.

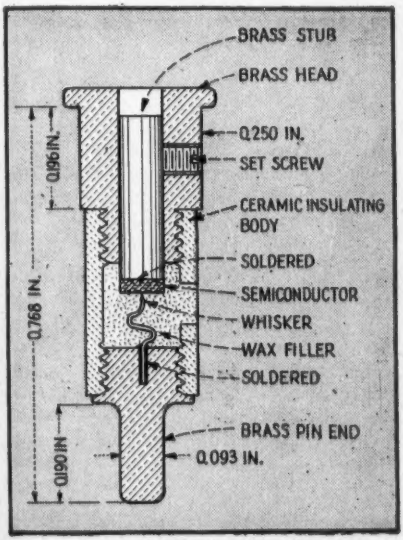
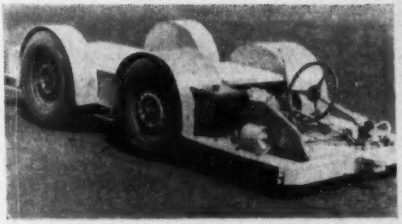


Diagram of a typical crystal rectifier.

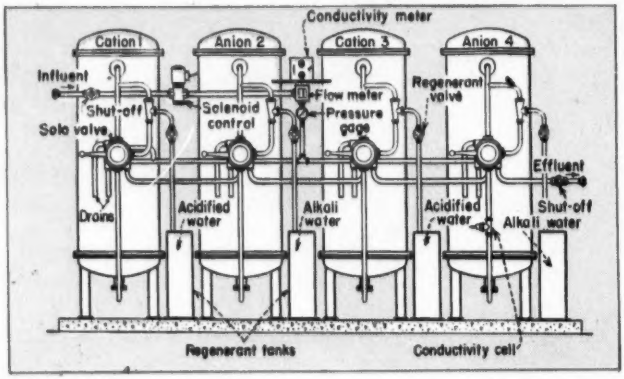
In a typical crystal rectifier, a ceramic cartridge with brass ends holds a pointed metal whisker and semiconductor in stable contact. It is thought that the difference in work function between the metal and semiconductor produces a potential barrier to the flow of electrons. This barrier drops slowly on the semiconductor side owing to the spare charge effect of the unneutralized impurity ions present in the semiconductor, and practically stops the flow of electrons from the metal to the semiconductor under any conditions. However, the electrons can flow from the semiconductor if its electronic potential is raised enough to allow the electrons to pass over the barrier. This also requires that appreciable voltage drop occur in the semiconductor contact, which is achieved by making the contact area small and producing a spreading resistance in the semiconductor. Consequently, the barrier will allow current to pass in one direction and not in the other.

Most present-day crystals are made from silicon, the whisker from annealed tungsten wire.

So far there have been 3 principal uses for crystal rectifiers—as detectors of microwaves, as mixers or converters, and as higher voltage lower frequency diodes. —ELECTRONICS



SUPPLY-HANDLING—One answer to the problem of transporting men, parts and materials in trackless mining is this 4-wheel truck with steering gear and platform or bed. Hitches permit towing or pulling. Such crawler-tractors can be powered by batteries or through the use of a trailing cable. —COAL AGE



Layout of columns of ion-exchanging synthetic resins used to produce good quality water from impure well water.

GOOD TOWN WATER

Soft potable water (dissolved solid content: 400 parts per million) is assured for a community in Kentucky by a new system of treating the hard, salty, brackish surface- and well-water (dissolved solids content: 3,000 parts per million) found in the vicinity. Previously, hauling and storing water for domestic use cost the community $1,600 a month, but with the present unit, cost is $400 a month. Raw water from a 400-ft. well is pumped to a 20,000-gal. storage tank, thence through 4 columns of alternate cationic and anionic exchange resins. The cationic exchangers convert the ionized salts of the raw water into acids, and the anionic exchangers remove the acids. An electrical conductivity cell indicates the quality of the water. The only expense is regeneration of the resins by dilute solutions of sulphuric acid and soda ash. —COAL AGE

NEW CRUSHER DESIGN

Power losses have been greatly reduced in Straub Mfg. Co.'s Simplex single-jaw crusher by unusual design. The upper pivot of the movable jaw lies on the line forming the center of the vee between the 2 jaws. A pitman operating on an eccentric applies power to the central pivot of a pair of toggle arms which, in turn, transmits motion to the bottom of the movable jaw. These parts operate in an oil bath, transmitting the motion to the jaw mechanism through a flexible diaphragm. —CHEM. & MET. ENGRG.

ELECTRONIC METAL SORTER

Utilizing the principle of triboelectrification, Control Equipment Co.'s new portable sorter nondestructively identifies the composition of metal parts and distinguishes a heat-treated piece. A known metal specimen is reciprocated against the unknown part, both being connected to an electronic circuit and a microvoltmeter. If the metals are identical, the reading is zero, if not, the polarity and magnitude of the reading indicate the degree of dissimilarity between the metals. —BUSINESS WEEK

64-FEED CIRCULAR KNITTER

Using 64 feeds, the new circular-knit machines at Elbert Mills, Inc., produce underwear fabric from 18/1 and 20/1 combed-peeler yarns at approximately 32 lb. per hr. and somewhat better fabrics from 60/2 yarns at 25 lb. per hr. Although all fabrics are dyed or bleached in the piece, dyed yarns may be run for pattern effect, and blends of wool, rayons, and cotton may be knitted on the machines. The machines have micromatic stitch-control dials. —TEXTILE WORLD

Teen-Age Market Booms

Manufacturers, retail stores, and magazines have discovered that special products for young girls can be sold at a special price

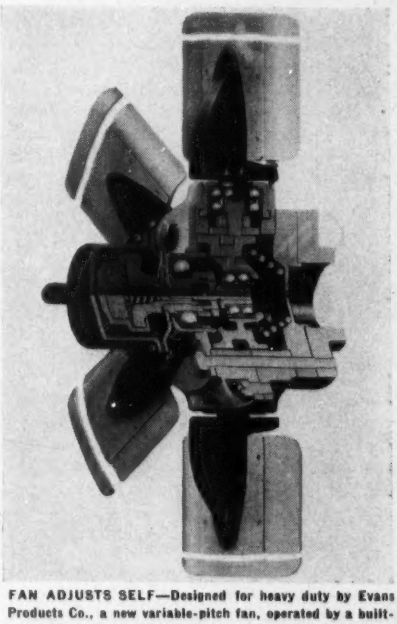
While the teen-age female market is no new physical entity, publishers, manufacturers, and retailers have only recently come to realize the extent to which that market can be sold special products at special prices. The magazine *Mademoiselle* showed that specialization by age groups was possible and profitable, and a batch of teen-age publications was introduced in 1942.

As incomes soared during the war and durable goods disappeared, more and more of the paternal paycheck was allotted to women, and particularly young daughters. Department stores and garment manufacturers jumped at this opportunity, and the teen-age market was in full swing. When it discovered that 25% of its size 9 to 15 dresses was being sold in special teen-age corners by enterprising children's wear buyers, a leading supplier adopted the name "Teentimers, Inc." and concentrated on its trademarked "OHriginals" for teen-agers. The difference was not merely a matter of style, but of proportions—teen-agers' undeveloped figures require shorter overall length, larger waist measure, and smaller bust measure than women's sizes.

There was also a difference in merchandising. The heart of Teentimer's business is in 750 franchised department stores. Each is exclusive in its city, and each agrees: (1) to run at least one newspaper advertisement a month featuring Teentimer OHriginals and (2) to maintain a Teentimer department, prominently identified.

Most of the stores organize Teentimer Clubs—chartered by Teentimers, Inc.—whose meetings frequently are fashion shows with members serving as models. 90% of the franchise stores appoint high-school advisory boards to guide them on teen-age preferences, with appropriate local publicity. Many hold local contests to discover the most typical teen-age girl. National publicity in Teentimer clothes is consistent and voluminous. Biggest promotion is in a Saturday morning radio show over 80 NBC stations.

Department stores report that the volume of teen-age departments frequently surpasses that of women's and children's wear departments. The value to manufacturers is reflected in Teentimers' re-



FAN ADJUSTS SELF—Designed for heavy duty by Evans Products Co., a new variable-pitch fan, operated by a built-in thermal power element, adjusts itself to changes in engine and ambient temperature. By maintaining nearly constant engine operating temperature, it increases hp. output, reduces fuel, lubricating and maintenance costs, and lessens sludge deposits. —ENGRG. NEWS-RECORD

port of its own monthly sales increases: from about $20,000 in 1943 to $350,000 currently.

Teen-age merchandise also includes hats, girdles, special lipstick, shampoo, cologne, and other products.

The teen-age market has price limitations, and in dresses the big volume is in the $8 to $9 class. Lipstick is priced under standard varieties (75¢ instead of $1, for example). There is also a question as to the market's long-range permanence. —BUSINESS WEEK

WELLS FOR THE AMAZON

To secure adequate and pure water supply for the Amazon Valley, more than a dozen communities are installing dug wells with a double-wall filter section around the sides and graded filter beds on the bottom. The walls are of perforated hollow tile, the casing being strengthened by the addition of reinforced concrete rings and columns. Large bore diameters (10 ft.) facilitate inspection and storage. To prevent blow-ins of quicksand, excavation is done under water. —ENGRG. NEWS-RECORD

PREVENTS FREQUENCY DRIFT

It is possible to design a pentagrid converter to eliminate frequency drift in electron-coupled oscillators. The drift is caused by changes in cathode current because of the return of primary electrons repelled by the first grid. Use of the second grid for the oscillator circuit and introduction of shield plates as part of the inner screen, combined with making tubes to exact dimensions, provide an efficient absorption circuit for stray primary electrons. —ELECTRONICS

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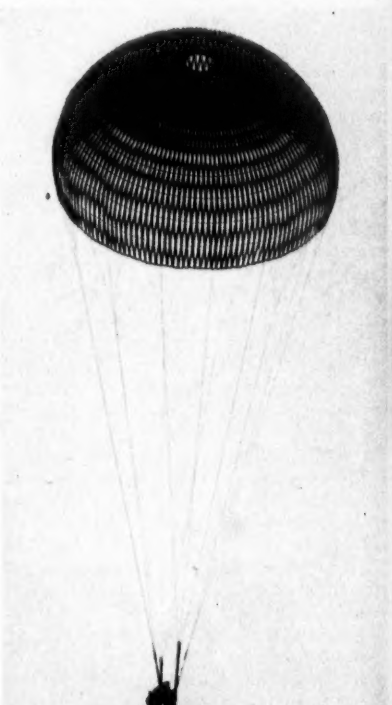
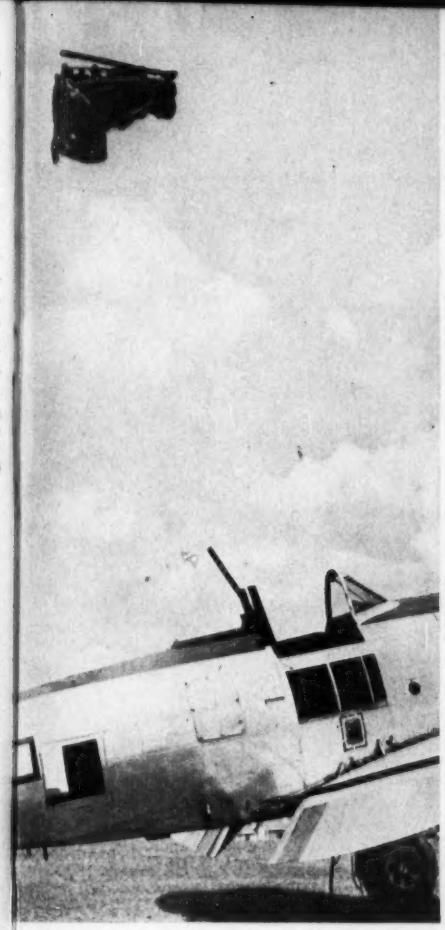
BERYLLIUM IMPROVES ALLOYS

One master alloy with 5% beryllium and 5% magnesium (remainder aluminum) and another with 20% beryllium and 15% magnesium are now in commercial production by Beryllium Corp. of Pa. Beryllium is used to decrease dross in magnesium-aluminum alloy castings, improve the mechanical properties of magnesium alloys, increase corrosion resistance of aluminum alloys, and retard burning of magnesium alloy. —POWER

VENTILATED 'CHUTE—The ribbon-type parachute, first conceived by the Germans, is now under test by U. S. air forces for possible use in extremely high altitude flying. It is designed to absorb shock. —AVIATION NEWS





BLOWS PILOT FROM PLANE—To reduce fatalities among pilots who must bail out of jet planes, the Army has developed a catapult which tosses a pilot 50 ft. in the air. One cartridge ejects chair and pilot; a second releases chair straps and opens a small parachute to pull chair away; a third, operated by an aneroid device, opens pilot's chute at a safe altitude. —BUSINESS WEEK

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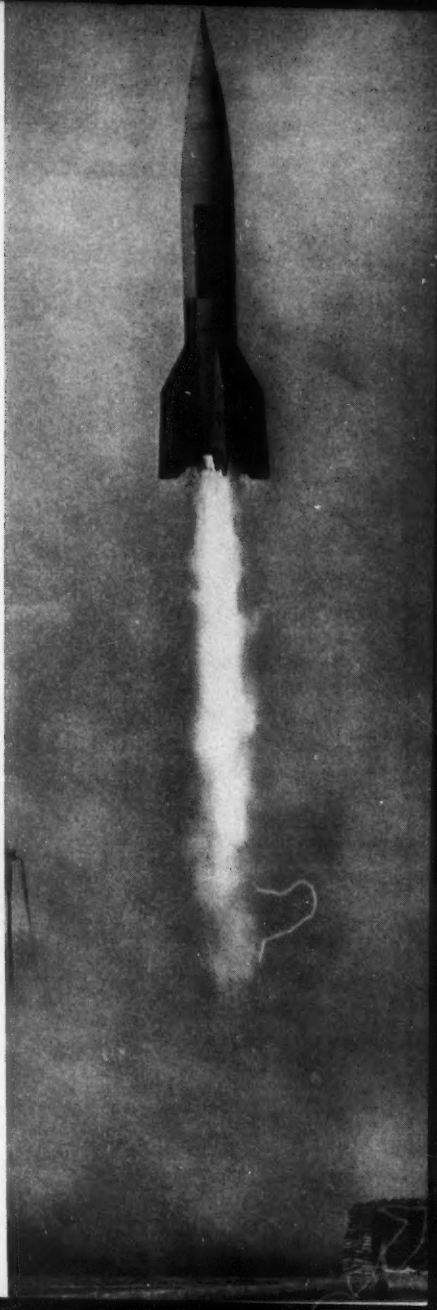

V-2 STUDIED IN ACTION—Terrifying weapon of World War II, the German V-2 rocket, with scientific instruments substituted for the warhead, has been fired in a series of tests at White Sands, N. M. Shooting 72 mi. skyward in one test (100 mi. was to be attained later), the rocket landed 39 mi. away, just 340 yd. from the calculated point (0.5% error). —AMERICAN MACHINIST

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